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A SURVEY AND ANALYSIS OF THE ADOPTION  
OF AUTOMATIC DATA PROCESSING IN  
CANADIAN SCHOOL DISTRICTS

by

H. DAVID HEMPHILL

A THESIS

SUBMITTED TO THE FACULTY OF GRADUATE STUDIES  
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FACULTY OF GRADUATE STUDIES

The undersigned certify that they have read, and recommend to the Faculty of Graduate Studies for acceptance, a thesis entitled "A Survey and Analysis of the Adoption of Automatic Data Processing in Canadian School Districts," submitted by H. David Hemphill in partial fulfilment of the requirements for the degree of Master of Education.

Date . October 19th, 1966. . . .





## ABSTRACT

The purposes of this study were (1) to determine the extent of the use of automatic data processing (ADP) in large Canadian school districts, (2) to determine which characteristics of the superintendent, the business administrator, the district, the school board, the school board members, and the community differentiated between adopters and non-adopters of ADP, and (3) to determine which of these characteristics best predicted the extent of ADP adoption.

A population of 103 districts, with grade 9 to 12 enrollment of 2000 or more, were mailed questionnaires designed to elicit information relevant to 30 research variables. A return sample of 58 districts, or 56.31 per cent of the population, was divided into two subsamples, adopters and non-adopters. These subsamples were compared on 6 superintendent, 6 business administrator, 10 district, 5 board member, 6 board, and 2 community variables. The t and chi square tests, with appropriate corrections for lack of homogeneity of variance and continuity, revealed differences, significant at the .05 level, between adopter and non-adopter districts on 6 variables. These differences indicated that adopter business administrators tended to have held positions in fewer organizations than non-adopter business administrators, that adopter districts tended to be larger than non-adopter districts in total enrollment, grade 9 enrollment, and total education staff, that adopter school boards tended to have



more members than non-adopter school boards, and that adopter districts were more likely to be situated in metropolitan areas with a population of 100,000 or more than in other areas.

The small number of districts in the adopter sample necessitated selecting from the 30 research variables fewer than 11 variables for the prediction of extent of ADP adoption. Using the criteria that the predictor variables should be highly correlated with the criterion variable, and have few or insignificant correlations with other predictor variables, 6 predictor variables were selected. A summed rank technique was used to select the business administrator's amount of formal post-secondary education, the number of years he had been in his present position, and the number of professional journals he regularly read, the district's grade 9 enrollment, the number of board members, and the mean years tenure of board members as predictor variables. Multiple regression analysis of these 6 variables, on a subsample of 9 districts, revealed the number of board members accounted for 72.91 per cent of the variance of the extent of adoption, and the business administrator's amount of education accounted for an additional 7.05 per cent. The contributions of the remaining 4 variables was negligible.

The survey of the use of ADP revealed that 14 Canadian school districts in the sample were using punch card or computer equipment for as many as 30 different pupil and business accounting operations. The average monthly costs for equipment rental or full ADP services from a data center ranged from \$120 to \$10,000.



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## TABLE OF CONTENTS

CHAPTER	PAGE
I. INTRODUCTION . . . . .	1
The Problem . . . . .	1
Statement of the problem . . . . .	1
Sub-problems . . . . .	1
Importance of the study . . . . .	2
Definitions of Terms . . . . .	3
Delimitations . . . . .	5
Limitations. . . . .	5
Assumptions . . . . .	6
Summary and Organization of the Remainder of the Thesis . . . . .	7
References for Chapter 1 . . . . .	8
II. REVIEW OF RELATED LITERATURE AND RESEARCH . . . . .	9
Introduction . . . . .	9
Unique Aspects of Educational Organizations . . . . .	10
The Adoption and Diffusion Processes . . . . .	13
The adoption process . . . . .	13
The diffusion process . . . . .	14
The Adopter . . . . .	17
The adopter organization . . . . .	17
Industrial innovation . . . . .	17
Educational innovation . . . . .	19



CHAPTER	PAGE
The individual adopter . . . . .	21
The external factors . . . . .	25
General Hypotheses . . . . .	27
References for Chapter II . . . . .	30
III. RESEARCH METHODOLOGY . . . . .	34
The Variables . . . . .	34
The dependent variable . . . . .	34
The independent variable . . . . .	34
Superintendent and business administrator variables . . . . .	35
District variables . . . . .	35
Board member variables . . . . .	36
Board variables . . . . .	37
Community variables . . . . .	37
The Questionnaire . . . . .	37
Data Collection . . . . .	38
The population . . . . .	38
Questionnaire distribution and collection . . . . .	39
The sample . . . . .	39
Data sources . . . . .	40
Statistical Treatment . . . . .	40
Data organization . . . . .	42
Examination of the sample for bias . . . . .	42



CHAPTER	PAGE
Research hypotheses . . . . .	45
Research hypothesis testing . . . . .	50
Prediction of the extent of adoption of ADP . . . . .	50
Summary . . . . .	51
References for Chapter III . . . . .	53
IV. DESCRIPTION OF THE SAMPLE . . . . .	55
Superintendents . . . . .	55
Business Administrators . . . . .	57
Districts and Communities . . . . .	57
Board Members . . . . .	60
Boards . . . . .	67
Relationships Between Variables . . . . .	67
Intra-group relationships . . . . .	69
Inter-group relationships . . . . .	71
Summary . . . . .	74
V. CHARACTERISTICS OF ADP ADOPTERS . . . . .	75
Superintendents . . . . .	75
Business Administrators . . . . .	77
Districts and Communities . . . . .	79
Board Members . . . . .	86
Boards . . . . .	90
Summary . . . . .	92
References for Chapter V . . . . .	95





CHAPTER	PAGE
VI. PREDICTION OF EXTENT OF ADP ADOPTION . . . . .	96
Description of the Adopter Sample . . . . .	96
Extent of ADP adoption . . . . .	97
Relationships between variables within the adopter sample . . . . .	97
Selection of Predictor Variables . . . . .	100
Prediction of Extent of ADP Use . . . . .	103
Summary . . . . .	103
References for Chapter VI . . . . .	106
VII. SURVEY OF ADP USE . . . . .	107
Reasons for Non-adoption . . . . .	107
Equipment . . . . .	110
Accounting Operations . . . . .	111
Business accounting . . . . .	111
Pupil accounting . . . . .	115
Costs . . . . .	115
Lease and purchase costs . . . . .	117
Data center costs . . . . .	117
The Future . . . . .	117
Summary . . . . .	120
References for Chapter VII . . . . .	123
VIII. SUMMARY, CONCLUSIONS AND SUGGESTIONS FOR FURTHER RESEARCH . . . . .	124



CHAPTER	PAGE
Summary of the Study . . . . .	124
Comparison of adopters and non-adopters . . . . .	124
Prediction of the extent of adoption . . . . .	125
Conclusions . . . . .	126
Discussion . . . . .	126
Research outside the field of education . . . . .	126
Canada as a social system . . . . .	127
The diffusion process . . . . .	127
The adoption process . . . . .	128
A single innovation . . . . .	128
Implications . . . . .	130
Inter-district cooperation . . . . .	130
Provincial coordination . . . . .	131
Suggestions for Further Research . . . . .	131
Automatic data processing . . . . .	131
Costs . . . . .	132
Applications . . . . .	132
Morale . . . . .	132
Educational Change . . . . .	133
Comparative studies . . . . .	133
Influencers of the adoption process . . . . .	133
References for Chapter VIII . . . . .	135
BIBLIOGRAPHY . . . . .	136



CHAPTER	PAGE
APPENDIX A. Introductory Letter and Questionnaire	
(English) . . . . .	142
APPENDIX B. Introductory Letter and Questionnaire	
(French) . . . . .	149
APPENDIX C. Return Group Comparisons . . . . .	156
APPENDIX D. Intercorrelation of Thirty Variables Within	
the Sample . . . . .	169
APPENDIX E. Intercorrelation of Independent and Dependent	
Variables Within the Adopter Sample . . . . .	173





## LIST OF TABLES

TABLE	PAGE
I. Distribution and Return of Questionnaires	
by Province . . . . .	41
II. Characteristics of Superintendents Comprising	
the Sample . . . . .	56
III. Characteristics of Business Administrators	
Comprising the Sample . . . . .	58
IV. Characteristics of Districts and Communities	
Comprising the Sample . . . . .	59
V. Number and Per Cent of Districts Comprising the	
Sample, by Enrollment Type . . . . .	61
VI. Number and Per Cent of Districts Comprising the	
Sample, by Religious Type . . . . .	62
VII. Number and Per Cent of Districts Comprising the	
Sample, by Community Type . . . . .	63
VIII. Characteristics of Board Members Comprising the	
Sample . . . . .	64
IX. Number and Per Cent of Board Members Comprising	
the Sample, by Sex . . . . .	65
X. Number and Per Cent of Board Members Comprising	
the Sample, by Selection . . . . .	66
XI. Characteristics of Boards Comprising the Sample . . . .	68
XII. Comparison of Adopter and Non-adopter Superintendents	
by Characteristics . . . . .	76



## TABLE

## PAGE

XIII.	Comparison of Adopter and Non-adopter Business Administrators by Characteristic . . . . .	78
XIV.	Comparison of Adopter and Non-adopter Districts and Communities by Characteristic . . . . .	80
XV.	Chi Square Test for Independence of Adopter or Non-adopter Districts and Enrollment Type . . . . .	82
XVI.	Chi Square Test for Independence of Adopter or Non-adopter Districts and Religious Type . . . . .	83
XVII.	Chi Square Test for Independence of Adopter or Non-adopter Districts and Community Type . . . . .	85
XVIII.	Comparison of Adopter and Non-adopter Board Members by Characteristic . . . . .	87
XIX.	Chi Square Test for Independence of Adopter or Non-adopter Board Members and Sex . . . . .	88
XX.	Chi Square Test for Independence of Adopter or Non-adopter Board Member and Selection . . . . .	89
XXI.	Comparison of Adopter and Non-adopter Boards by Characteristic . . . . .	91
XXII.	Frequency Distribution of Number of ADP Operations by Districts in the Adopter Sample . . . . .	98
XXIII.	Selection of Prediction Variables Using Ranks of Correlations with Criterion and Number of Significant Correlations with Other Variables . . . . .	101



## TABLE

## PAGE

XXIV.	Multiple Regression Prediction of Extent of ADP	
	Adoption by Six Selected Variables . . . . .	104
XXV.	Identification of Adopter Districts . . . . .	108
XXVI.	Summary of Stated Reasons for Not Adopting ADP . . .	109
XXVII.	Punch Card Equipment Used in Local Board	
	Offices, by District . . . . .	112
XXVIII.	Use of Computer in Local Office or Other	
	Center, by District . . . . .	113
XXIX.	Business Accounting Operations Performed on ADP	
	Equipment, by District . . . . .	114
XXX.	Pupil Accounting Operations Performed on ADP	
	Equipment, by District . . . . .	116
XXXI.	ADP Equipment Owned or Leased with Purchase Price	
	or Average Monthly Rental, by District . . . . .	118
XXXII.	Average Monthly Charge for Data Center Services	
	with Number of Operations Performed, by District .	119
XXXIII.	Summary of Future Plans for Implementation of ADP .	121
XXXIV.	Comparison of Return Groups One and Two by	
	Superintendent Characteristic . . . . .	157
XXXV.	Comparison of Return Groups One and Three by	
	Superintendent Characteristic . . . . .	158
XXXVI.	Comparison of Return Groups Two and Three by	
	Superintendent Characteristic . . . . .	159





TABLE	PAGE
XXXVII. Comparison of Return Groups One and Two by Business Administrator Characteristic . . . . .	160
XXXVIII. Comparison of Return Groups One and Three by Business Administrator Characteristic . . . . .	161
XXXIX. Comparison of Return Groups Two and Three by Business Administrator Characteristic . . . . .	162
XL. Comparison of Return Groups One and Two by District and Community Characteristic . . . . .	163
XLI. Comparison of Return Groups One and Three by District and Community Characteristic . . . . .	164
XLII. Comparison of Return Groups Two and Three by District and Community Characteristic . . . . .	165
XLIII. Chi Square Test for Independence of Enrollment Type and Return Group . . . . .	166
XLIV. Chi Square Test for Independence of Religious Type and Return Group . . . . .	167
XLV. Chi Square Test for Independence of Community Type and Return Group . . . . .	168
XLVI. Intercorrelation of Thirty Variables Within the Sample . . . . .	170
XLVII. Number of Cases for Each Cell in Intercorrelation Matrix Table XLVI . . . . .	172





TABLE	PAGE
XLVIII. Intercorrelation of Independent and Dependent Variables Within the Adopter Sample . . . . .	174
XLIX. Number of Cases for Each Cell for Intercorrelation Matrix in Table XLVIII . . . . .	176



## LIST OF FIGURES

FIGURE	PAGE
1. Adopter Categorization on the Basis of Relative Time of Adoption of Innovations . . . . .	16
2. Categorization of the Sample on the Basis of Adoption or Non-adoption of ADP . . . . .	129



## CHAPTER I

### INTRODUCTION

The current ferment in education is a result of two "explosions". The explosion of knowledge has sparked unprecedented interest in curriculum planning.\* The explosion of population and the need for increased education have caused an extremely rapid growth in student population. These factors and many more led the National Education Association Project on Instruction to recommend that "school authorities should examine the potentialities of automation for storage and retrieval of pupil personnel data and instructional materials."<sup>1</sup>

#### I. THE PROBLEM

##### Statement of the Problem

The purposes of this study were (1) to determine the extent of the use of automatic data processing (ADP) in Canadian school districts, and (2) to survey and analyze the characteristics of selected adopter and non-adopter districts.

##### Sub-problems

The study sought answers for the following questions.

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\* See for example Jerome S. Bruner, The Process of Education (New York: Random House, 1960); and John I. Goodlad, School Curriculum Reform in the United States (New York: The Fund for the Advancement of Education, 1964).





1. How many school districts are using ADP equipment, what operations are being performed on this equipment and at what cost?

2. What characteristics of the school district personnel, the school board, the superintendent, the business administrator and the community differentiate districts that have adopted ADP and those that have not?

3. What characteristics of the school district personnel, the school board, the superintendent, the business administrator and the community predict the extent of adoption of ADP?

#### Importance of the Study

In the United States, with funds secured under the National Defence Education Act of 1958, several projects on the use of ADP in education have been completed and evaluated.\* Wogaman<sup>2</sup> and Greenhalgh<sup>3</sup> found that the use of ADP in school systems provides more information, more quickly, and more accurately than manual methods and with no loss of administrative flexibility. Although total implementation of an ADP system may not be less expensive than manual methods, Moreland<sup>4</sup> found that per pupil costs decrease with greater scope of ADP applications, and Kenney<sup>5</sup> demonstrated that the cost of a specific operation (student scheduling) can be greatly reduced using ADP.

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\* One is reported in A Report of a Study--Processing Pupil Personnel Data, Bulletin of the California State Department of Education, XXXI, No. 2 (March, 1962).



Automated data-processing equipment is playing an increasingly important role in our economy. Many of the operations previously done in business and industry by hand and with great expenditure of time and energy are being done far more efficiently by electronic data-processing equipment, and certain operations previously considered impossible to handle are being done proficiently by such equipment. The schools, however, have in large part failed to utilize electronic data-processing equipment to the full extent.<sup>6</sup>

The present study isolated characteristics of school districts which were related to the adoption of ADP, and by its exploratory nature, suggested areas for further research.

Increased knowledge of the characteristics of superintendents, business administrators, districts, and school boards related to the adoption and extent of adoption of ADP, and knowledge of the present status of ADP operations and equipment, provides information vital to the rational implementation of automated techniques.

## II. DEFINITIONS OF TERMS

Automatic Data Processing (ADP). This study uses the term to mean the collection, storage, transformation and retrieval of data by mechanical and/or electronic equipment.

School District. As used here, the term refers to any geographic area set aside for the purposes of administering the schools. It includes school divisions, counties, or units.

School Board. This term means the board of trustees, elected or appointed, which is charged with the responsibility of administering the schools within a district.





6.

Superintendent. This term refers to the chief educational official of the district.

Business Administrator. This term refers to the chief business official of the district. It includes what in many districts would be called the secretary-treasurer.

Adopter District. This term refers to any district which performs any pupil or business accounting operation in full or in part with ADP equipment.

Non-adopter District. This refers to any district in the sample which does not meet the criterion of adopter districts.

Denominational School District. As used in this study, the term means any school district organized to educate children of a particular religious faith.

Public School District. This term refers to any school district not organized for children of a specific religious denomination.

Unified School District. This term refers to the districts administering all levels of public education offered within the community.

Secondary School District. This term refers to those districts administering the secondary grades of public education. It includes the High School and Collegiate Institute boards of Ontario and Saskatchewan.

Metropolitan District. This term refers to the school districts



within the metropolitan areas determined by the 1961 Census of Canada. The basic criterion of designation of an area as metropolitan in this census report was a population of 100,000 or more.

Metropolitan areas, as defined for the census, relate to groups of urban communities in Canada which are in close economic, geographic and social relationship.<sup>7</sup>

Non-metropolitan District. This term refers to those districts not within metropolitan areas.

### III. DELIMITATIONS

This study did not attempt analysis of the adoption or diffusion processes, or examination of the psychological characteristics of the individuals involved in the adoption of ADP. Furthermore, the data collected were related only to the present characteristics of the large districts enrolling secondary pupils. No attempt was made to consider factors beyond the immediate boundaries of the sample districts, nor was any attempt made to examine the use of ADP outside the district central office. That is, no consideration was given to provincial administrative patterns, to provincial or federal fiscal policies, or to the use of ADP within the district schools.

### IV. LIMITATIONS

A serious limitation to research of the type used in the current study is the possibility of a biased sample. Guilford makes the





following comment.

In a biased sample there is a systematic error. Certain types of cases have an advantage over others in being selected. The likelihood of individuals being chosen differs from one to another. A common example of this in educational research is the voluntary return of questionnaires . . . . [Those] who do return the data might possibly be representative, but there is a strong presumption that there is room for biasing forces to work. Those forces may or may not be relevant to the content of the questionnaire itself. But if the information requested implies favorable or unfavorable facts about the respondent, his associates, or his work, it is quite natural to expect that those with a "good" showing will be more inclined to reply than those with a "bad" showing. If the trait of cooperativeness or of responsibility or of dependability of the respondent is involved in the data or even correlated with something wanted in the data, there is also a strong likelihood of bias.<sup>8</sup>

Examination for bias of the returned data is included in Chapter III.

A second major limitation to the study was the return of incomplete questionnaires. The previously stated comment by Guilford would apply here as well. No attempt was made to examine the incomplete questionnaires to reveal biased replies.

Finally, although the foundation for the hypotheses examined in this study is drawn from the traditions of research on the adoption and diffusion of innovations, it should be noted that generalizations on the adoption of innovations in education from a single innovation (ADP) are tenuous.

## V. ASSUMPTIONS

This study is based on the following assumptions.

1. The decision to adopt ADP is made by the district school



board.

2. The information and advice given to the board by the chief executive officers is related to their own personal characteristics.

3. The characteristics of the district, the community, the board, and its chief executive officers, have not substantially changed since the decision to adopt or not to adopt ADP was made.

## VI. SUMMARY AND ORGANIZATION OF THE REMAINDER OF THE THESIS

This introductory chapter has outlined the problem which initiated this research, its importance, the definition of terms used, and the delimitations, limitations and assumptions which underly the study. The remainder of the thesis will be organized in the following way.

Chapter II. Review of Related Literature and Research.

Chapter III. Research Methodology.

Chapter IV. Description of the Sample.

Chapter V. Characteristics of ADP Adopters.

Chapter VI. Prediction of Extent of ADP Adoption.

Chapter VII. Survey of ADP Use.

Chapter VIII. Summary, Conclusions and Suggestions for Further Research.





## REFERENCES FOR CHAPTER I

- <sup>1</sup>National Education Association, Schools for the Sixties (New York: McGraw-Hill Book Company, 1963), p. 104.
- <sup>2</sup>Thomas Donald Wogaman, "Data Processing: Its Introduction and Use in Secondary Schools" (unpublished doctoral dissertation, The University of California, Berkeley, 1965), Dissertation Abstracts, XXVI, p. 843.
- <sup>3</sup>John Greenhalgh, Jr., "The Effect of the Installation of Automatic Data Processing Equipment on the Administrative and Educational Services in New England Public School Systems" (unpublished doctoral dissertation, The University of Connecticut, 1964), Dissertation Abstracts, XXV, p. 4494.
- <sup>4</sup>Andrew Smith Moreland, "A Study of the Application of Machine Data Processing in Selected Small Districts in the United States" (unpublished doctoral dissertation, Rutgers--The State University, 1964), Dissertation Abstracts, XXV, p. 2829.
- <sup>5</sup>James Benson Kenney, "A Comparison of Two Methods of Class Scheduling" (unpublished doctoral dissertation, The University of Arkansas, 1964), Dissertation Abstracts, XXV, p. 5681.
- <sup>6</sup>California State Department of Education, A Report of a Study--Processing Pupil Personnel Data, Bulletin of the California State Department of Education, XXXI (March, 1962), p. 1.
- <sup>7</sup>Dominion Bureau of Statistics, 1961 Census of Canada, Introductory Report to Volume I (Part 1), Bulletin 1.1 - 11, (Ottawa: Queen's Printer, 1962), p. xi.
- <sup>8</sup>J. P. Guilford, Fundamental Statistics in Psychology and Education (fourth edition; New York: McGraw-Hill Book Company, 1965), pp. 139-140.





## CHAPTER II

### REVIEW OF RELATED LITERATURE AND RESEARCH

#### I. INTRODUCTION

Whether or not change is a result of the gap between institutional means and cultural goals<sup>1</sup> or between actual and ideal behavioral patterns,<sup>2</sup> anthropologists seem to agree that cultural change is inevitable. One result of cultural change is that the socializing agencies or institutions of the culture tend to have ways, values and beliefs which change less rapidly than those of the culture or society at large. "The seriousness of the strain or the disorganization produced by unequal rates of change in society depends upon the closeness of integration of the different parts."<sup>3</sup>

It seems axiomatic that education is an integral part of contemporary western culture. But this culture is changing more rapidly than has any culture in the past. The result of this rapid change places education in the position of lagging behind the vanguard of the society by what has been variously estimated at up to fifty years.<sup>4</sup>

The word "lag" implies that the proper course of action is to catch up the lag in the variable that has not changed or that is changing more slowly, so that it will be in better adjustment with the variable that has changed.<sup>5</sup>

Shortening of the time lapse between the "insight into a



need . . . and the introduction of a way of meeting the need . . ."<sup>6</sup> has been the subject of a great deal of research. The purpose of this chapter is to examine some of the research on the adoption and diffusion of innovations in education and other areas as a basis for development of hypotheses for the present study.

## II. UNIQUE ASPECTS OF EDUCATIONAL ORGANIZATIONS

Although this study is concerned with the adoption of an innovation in education, the hypotheses are partly drawn from research in other areas. Therefore, the unique aspects of educational organizations and the roles that individuals must play within these organizations should be considered.

Campbell et al. discuss the placement of educational organizations compared to the positions of other organizations on six continua. The continua used are cruciality, visibility, complexity, intimacy, staff professionalization, and difficulty of appraisal. They consider public education to be highly crucial, highly visible, and fairly high in complexity, intimacy, staff professionalization and difficulty of appraisal.<sup>7</sup> The "profile" of educational organizations on these six continua is similar to few other organizations. However, in discussing the functions of organizations, Campbell comments, "this analysis suggests that the common elements in administration tend to be found at the managerial level and the differentiations at the technical and institutional levels."<sup>8</sup> The important point here is that,





although there are many aspects of educational organizations which are unique, the similarities of managerial functions of educational and other organizations permits development of hypotheses in education from research conducted in other areas.

The analysis suggested by Campbell does not, however, specify aspects of educational organizations which account for their relatively high degree of inertia. A number of writers have suggested characteristics of education which tend to make it slow to change, or which are barriers to the adoption of innovations.

Miles summarizes the theory and findings related to innovation in educational systems in the following way.

The diffusion rates in educational systems may be slower than those found in industrial, agricultural, or medical systems for several reasons: the absence of valid scientific research findings, . . .; the lack of change agents to promote new educational ideas . . .; and the lack of economic incentive to adopt innovations.

. . . . .

. . . it certainly seems possible that vulnerability to outside influence, the use of persons rather than physical technology as primary instruments of change, and lay control may all serve to lower innovation rates in educational organizations, seen comparatively with other organizations.<sup>9</sup>

It has also been suggested that the difficulties encountered in measuring the output of educational systems and the narrowness of the distance between lay and professional competence ("partly because everyone has experienced an educational system and thus claims expertise") may slow down innovation attempts and tend to ritualize behavior.<sup>10</sup>

Carlson suggests that, in addition to these characteristics



the "domesticated" nature of public education tends to inhibit innovation. He describes a "domesticated organization" as one that is not required to compete for clients, and in which the clients are not free to accept or reject the organization's services.

These organizations are domesticated in the sense that they are protected by the society they serve. The society sees the protection of these domesticated organizations as necessary to the maintenance of the social system and creates laws over and above those applying to organized action in general to care for these organizations.

The consequence of domesticating organizations, as far as organizational change is concerned, is to restrict the need for, and interest in, change because the environment of the domesticated organization in many important respects is more stable than it is in other types of organizations. When important elements of the environment are stable . . . the necessity for change is reduced.

Therefore, it seems reasonable to suggest that the domestication of public schools is a hinderance to change . . .<sup>11</sup>

This suggestion is supported by Mansfield who found industrial firms tended to be slower to imitate (adopt innovations) when they were non-competitive.<sup>12</sup>

Wilson suggests that:

. . . the greater the diversity of the organization (in either its incentive system, its task structure or both), the greater the likelihood that some members will conceive major innovations, the greater the likelihood that some members will propose innovations, and the less the likelihood that the organization will adopt the innovations.<sup>13</sup>

He further suggests that both the incentive system and the task structure for individuals involved in education are extremely complex and that this complexity contributes to the relatively late or slow adoption of innovations in educational organizations.<sup>14</sup>





Although the unique characteristics of educational organizations have been emphasized in this section, the roles played by the chief executives and others in education have a degree of similarity with those in other organizations which permits development of hypotheses for the present study from research in a variety of different areas.

### III. THE ADOPTION AND DIFFUSION PROCESSES

Time of adoption of ADP is not a variable of the current study, but a brief description of the adoption and diffusion processes will serve as a framework for interpretation of the results of this study.

#### The Adoption Process

The adoption process is the mental process through which an individual passes from first hearing about an innovation to final adoption. Five stages in the adoption process are: awareness, interest, evaluation, trial, and adoption. The adoption process differs from the diffusion process in that the adoption process deals with adoption of a new ideas by one individual while the diffusion process deals with the spread of new ideas in a social system . . .<sup>15</sup>

Rogers suggests that although the mental processes of individuals can be examined only indirectly, "there is evidence that the concept of stages in the adoption process is valid."<sup>16</sup> He further suggests that each adopting unit passes through these five stages.

1. The awareness stage. At this stage the individual has been exposed to but lacks complete information about the innovation.

2. The interest stage. At this stage the individual becomes



more interested in and seeks more information about the new idea.

3. The evaluation stage. It is at this stage that the individual decides whether or not to try the innovation on the basis of a mental application of it to his present and anticipated future situation.

4. The trial stage. At this stage the individual adopts the new idea on a limited basis to test its feasibility in his own situation.

5. The adoption stage. At this stage the individual decides to continue and extend the use of the innovation.<sup>17</sup>

Two comments should be made about the adoption process. First, it should be noted that the adoption process is a type of decision making. The stages in the adoption process are similar to the steps in the description of the decision-making process. ". . . the adoption process . . . is a special type of decision-making, however, with attributes not found in other kinds of situations."<sup>18</sup>

Second, the division of the adoption process into stages was suggested for practical and conceptual utility. The stages are, of course, not discrete, they merely represent relative positions on the adoption process continuum.

### The Diffusion Process

Diffusion is the process by which an innovation spreads. The diffusion process is the spread of a new idea from its source of invention or creation to its ultimate users or adopters.<sup>19</sup>

The purpose of this section is not to present research on the diffusion of innovations, but rather to present a description of what has become conventional categorization of adopters in a social system.

Rogers reviews research and discusses theory which points toward





the generalization that the adoption of an innovation in a social system is normally distributed with respect to time.<sup>20</sup> He states:

A general finding of past research is that the adoption of an innovation follows a bell-shaped curve when plotted over time. This type of distribution is essentially "S"-shaped when plotted on a cumulative basis.<sup>21</sup>

Using the two parameters, mean and standard deviation, and a "time scale" method of adopter categorization developed by Mort and Pierce,<sup>22</sup> Rogers proposed a method of classification for adopters of agriculture practices which has become fairly well accepted in most fields of diffusion studies.

Figure 1 illustrates Rogers' classification. The first 2.5 per cent of the adopters in the social system are called innovators, the next 13.5 per cent are called early adopters. The next 68 per cent are divided equally into the early and late majority, and the remaining 16 per cent are called laggards. This nomenclature will be used throughout the remainder of the review of research where Rogers' categorization has been utilized.

The volume of research on the adoption and diffusion of innovations is too great for presentation, even in summarized form, in this report.\* Rather, a selected number of research project

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\*For more complete summaries see Everett M. Rogers, Diffusion of Innovations (New York: The Free Press of Glencoe, 1962); Herbert F. Lionberger, Adoption of New Ideas and Practices (Ames, Iowa: The Iowa State University Press, 1960); and Matthew B. Miles (ed.), Innovation in Education (New York: Bureau of Publications, Teachers' College, Columbia University, 1964).





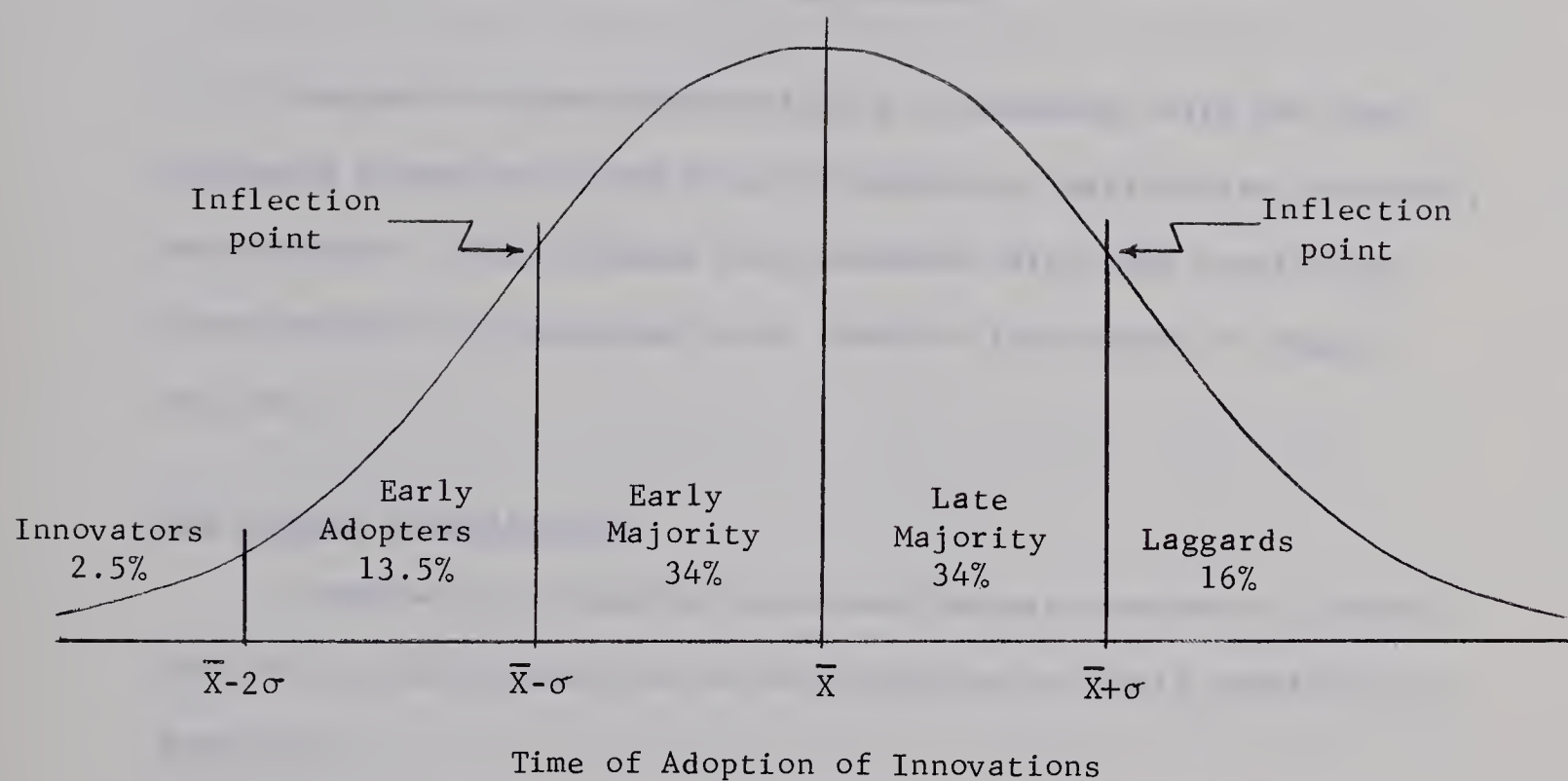


FIGURE 1

ADOPTER CATEGORIZATION ON THE BASIS  
OF RELATIVE TIME OF ADOPTION  
OF INNOVATIONS\*

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\* Everett M. Rogers, Diffusion of Innovations (New York: The Free Press of Glencoe, 1962), p. 162.



findings will be examined for characteristics of adopting units relevant to the present study.

#### IV. THE ADOPTER

Research on the characteristics of adopting units has been conducted primarily in the areas of education, agriculture, industry, and medicine. These studies have revealed, with some consistency, characteristics of adopting units, whether individuals or organizations.

##### The Adopter Organization

Industry and education have been the major source of information on the characteristics of an innovative (or early adopter) organization.

Industrial innovation. Some of the most recent and comprehensive studies of industrial innovation and change were conducted by Carter and Williams. They found that the decision to adopt an innovation was influenced by the "worthwhileness" of the innovation in terms of a reduction in cost or increase in quality of the product, by the attitudes of the adopter toward the problems created by adopting the innovation, and the capacity of the adopting unit to find financial resources for the adoption of the new idea.<sup>23</sup> In addition, they report that:

To a great extent the receptiveness of a firm to technical change must depend on the understanding and appreciation of



science and technology to be found in the various ranks of management; and this, in turn, depends on the training and experience of individual managers.<sup>24</sup>

Further research by the same team revealed that subscription to scientific journals and degree of contact with the university were related to innovativeness;<sup>25</sup> here "innovativeness is defined as the degree to which an individual is relatively earlier in adopting new ideas than the other members of his social system."<sup>26</sup>

Sutherland says:

The effects on the availability and need for labour, the effect of quality improvement, and, above all, the effect on the morale of the firm seem more important than the calculable effect on costs or profits.<sup>27</sup>

Despite this comment, the researchers in the field of industrial innovation have been primarily concerned with the relationship of innovation to costs and profits. They have shown, with some consistency, that wealth and innovation are directly related to each other. Wealth "may be measured by high income, by a large-sized operation, or by the possession of wealth."<sup>28</sup>

The relationship of wealth and innovation was also found in agriculture and medicine. Rogers found innovators and early adopters had higher gross farm incomes and Coleman and others found doctor-innovators had clients with higher incomes.<sup>29</sup>

Rogers cites research in support of the generalization that "early adopters have more specialized operations than later adopters."<sup>30</sup> Although there is relatively little empirical support for this statement, examination of the degree of specialization of farms







has shown it to be fairly consistently and positively related to innovativeness.

Educational innovation. The tradition of innovation studies in education has been dominated by the research conducted at Columbia University. Three decades and over 200 research projects on the adaptability (essentially a synonym for innovativeness) of school systems has produced a well integrated and well documented set of system characteristics related to the adoption of innovations.

In summarizing the results of these projects, Mort lists the following findings:

1. Typically, an extravagantly long time elapses before an insight into a need (or a discovery that past practice is indefensible) is responded to by innovations destined for general acceptance in the schools.

2. The spread of an innovation through the American school system proceeds at a slow pace.

3. The rate of diffusion of complex innovations appears to be the same as that for simple innovations; innovations that increase cost move more slowly than those that do not.

4. Communities vary in the degree to which they take on new practices. Indications are that this is a community characteristic. A community that is slow to adopt one innovation tends to be slow to adopt others. A pioneer in one area tends to a pioneer in other areas.



5. Explanation of the differences in educational adaptability of communities can be found in no small degree in the character of the population, particularly in the level of the public's understanding of what schools can do, and citizen's feeling of need for education for their children. This appears to set the posture of the community toward financial support, and toward what teachers are permitted to do--and tends to shape the staff by influencing personnel selected and kept in the community.<sup>31</sup>

He also makes the following comments.

. . . except for amount of schooling, the factors given emphasis (in the late 1930's) in the selection of teachers did not appear to have very much bearing on adaptability, and that there was a relationship of surprising magnitude between the community and adaptability of school systems. The measured relationship of school support (defined financially, and to a lesser degree in terms of public interest) to adaptability confirmed earlier hypotheses.

. . . . .

. . . school systems with high adaptability were those where teachers were more highly trained and more accepting of modern practices (though community size and wealth appear to be the basic factors underlying these) . . .

. . . . .

For example, Bigelow found more rapid diffusion in those communities of the Metropolitan School Study Council which had higher financial support in schools and higher levels of parental education and occupation.<sup>32</sup>

In terms of their contribution to the fund of knowledge about the adaptability of school systems, the Columbia studies are without equal. However, in discussing these studies Rogers says:

The education diffusion tradition is one of the largest in number of studies, but this tradition is probably one of lesser significance in terms of its contributions to understandings of the diffusion of ideas.<sup>33</sup>





Several reasons have been put forward to account for the lack of significance attributed to innovation studies in education. Eichholz and Rogers suggest that, "when the school or school system is used as a unit of analysis, much of the individual variation in innovativeness and other variables is cancelled."<sup>34</sup> Carlson comments:

The Mort studies seem to have contributed little to the understanding of the diffusion of ideas because, among other reasons, the determinant factor (financial support) was narrowly conceived. Also, the studies ignored the large general body of research on the adoption process.<sup>35</sup>

In another article he further stated that the Columbia research directors,

. . . seemed steadfast in their refusal to deviate from the implicit assumption that the chief school official is simply a victim of the local school budget and is therefore not relevant as an explanatory element in the adoption process. The lack of attention given to the chief school official is even more noticeable when coupled with the awareness that the common procedure for the adoption of a new practice involves his approval.<sup>36</sup>

As an attempt to fill the gap in knowledge, left by the Columbia researchers by their unconcern for the individual as a factor in the adoption process, Carlson examined the superintendent as an element in this process. He used, as a framework for his study, the traditions of research on the individual in the adoption and diffusion processes. The succeeding section includes a review of these traditions as well as a summary of the findings of Carlson's research which have relevance to this study.

### The Individual Adopter

Much of the research on the diffusion of new ideas through





social systems has been conducted using physicians, farmers and school superintendents as subjects. The variables examined have included such sociological characteristics as status, prestige, opinion leadership, and communication patterns, and such psychological characteristics as rationality, flexibility, and dogmatism.

The present study, however, is not directly concerned with the social matrix or psychological make-up of the individual adopters. It is concerned with some personal characteristics of individuals which have fairly consistently differentiated adopters (or innovators) from non-adopters (or laggards).

Coleman, Katz and Menzel found that physicians who prescribe a new drug relatively earlier than other physicians tend to be younger and to subscribe to more professional journals.<sup>37</sup> An earlier study reported by Gross, however, found that acceptors of new farm practices were 6.4 years older than non-acceptors. In addition, acceptors were significantly better educated, read more research bulletins, and had larger farms with higher incomes than non-acceptors. Length of time in one location (tenure), number of different farm locations (mobility), and nationality were found to be non-significant variables.<sup>38</sup>

Carlson concentrated his attention on the superintendent. He maintained that the assumptions upon which the Columbia studies were based did not truly represent reality. To examine the school system without considering the superintendent was to assume that either " . . . the superintendent is a victim of his budget and is therefore of no



consequence in the adoption process . . ."<sup>39</sup> or,

. . . his position in the organizational structure, specifically his subordination to the school board, renders him powerless and thus not consequential in the matter of acceptance of new practices.<sup>40</sup>

The results of Carlson's research lend support to the following comment by Brickell.

The administrator may promote--or prevent--innovation. He cannot stand aside, or be ignored. He is powerful not because he has a monopoly on imagination, creativity, or interest in change--the opposite is common--but simply because he has the authority to precipitate a decision. Authority is a critical element in innovation, because proposed changes generate mixed reactions which can prevent consensus among peers and result in stagnation.<sup>41</sup>

Carlson examined more than twenty superintendent and district variables and their relation to the adoption of several innovations in two areas. Although the results in the two areas were not identical, the correlations of independent and dependent variables in Allegheny county, Pennsylvania, indicate the kinds of relationships which appeared. The findings relevant to the current study are summarized by Carlson in the following way.

The direction of these significantly correlated variables indicates that high rate of adoption is associated with superintendents who were promoted to their positions from outside the school system, who were highly educated, . . . and who had recently acquired some formal education. The directions of these correlations also indicate that high rates of adoption are associated with school systems that have comparatively high levels of expenditure per pupil, and large enrollments.<sup>42</sup>

In addition to these relationships, he found a tendency for non-adopters to have less formal education than adopters,<sup>43</sup> and for innovators to be younger and have shorter tenure than all others with





equal chance to adopt.<sup>44</sup>

Although Carlson has clearly demonstrated that the superintendent is a significant factor in the adoption of innovations, some recent research suggests that other individuals within the district may also be significant factors in the adoption process. In studies of school board expectations for provincially appointed superintendents, both Finlay and Stafford found that board members did not expect the superintendent to exert much influence on district business and financial policies.<sup>45</sup> Hrynyk's conclusion that secretary-treasurers do exert influence on board decisions, especially in the areas of business and finance,<sup>46</sup> suggests that the business administrator should be examined as a factor in the adoption of innovations which affect the business or financial operation of the district. Smith has commented, ". . . the business administrator must be alert to change, growth and new methods, and he should be prepared to propose changes in policy and procedures to the board."<sup>47</sup>

The adoption of automatic data processing has applications and implications for both educational and business operations and it seems reasonable to expect both educational and business executives to be factors in the adoption process. There also seems to be some logical basis for assuming that the research on the characteristics of superintendents, related to the adoption of innovations, is also relevant to the business administrator.

Examination of the characteristics of superintendents, business administrators, and school districts does not, however, take





into account the possibility that others, external to the system, may be influencers of the decision to adopt an innovation.

Brickell suggests that:

There are two distinct groups of people who might be expected to influence structural changes in the local public schools: the public, which is external to the institution, and the profession, which is internal to it. The process of local educational change is determined by the relationships between and within these two groups: the public and the board of education as external, the administrators and the teachers as internal.

.....

Public schools are structured in such a way that the chief administrator can be kept responsive to external demands: the superintendent serves in a contractual relationship to a lay board of education.<sup>48</sup>

However,

Like the public, the board of education in most communities is not a strong agent in determining the path of educational innovation, but its influence is decisive when exerted.<sup>49</sup>

Research on the characteristics of adopter individuals and organizations has been cited as a basis for the development of hypotheses related to these internal factors in the adoption process. There is also a body of research upon which to base hypotheses related to the external factors in this process.

### The External Factors

The external factors which the present study examines are the characteristics of residents of the community in which the school system operates and the representatives of these residents, the local school board members.



The Columbia University studies included examination of a number of community characteristics. Kumpf summarizes the findings as follows.

An adaptable school tends to be located in a community which is near 100,000 in population, has many people represented in the white collar or professional occupations, has a high cultural level, has a high percentage of owner-occupied dwellings, and has many inhabitants 50 years of age or older. It tends to be high in per capita wealth, per pupil expenditure for education, per cent of 8th grade, high school and college graduates. A fairly high median (education level) has been attained by those who are 25 years of age and older in the community. There is low percentage of the population foreign born.<sup>50</sup>

One other study in education has relevance to this study.

Duncan and Kreitlow paired culturally homogeneous and heterogeneous neighborhoods and found that:

Heterogeneous neighborhoods were definitely more favourable toward school practices than were the homogeneous neighborhoods. On 20 of the 30 practices the heterogeneous neighborhoods were more favourable . . .<sup>51</sup>

The effect of cultural norms on the acceptance of innovations is illustrated by a study conducted by Pedersen. He found that a Danish community accepted new agricultural practices much more readily than a Polish community.<sup>52</sup>

Rogers suggests that the reason for this difference in readiness to accept innovations lies in the fact that:

The Polish farmers came from a background of subsistence farming; the Danish farmers were accustomed to producing for a world food market. The cultural values of the Danish farmers facilitated the adoption of new ideas, whereas the norms of the Polish community perpetuated the status quo.<sup>53</sup>

The purpose of this chapter was to review the research on the







adoption and diffusion of innovations as a framework for the development of hypotheses for the current study. The concluding section presents some general hypotheses which serve as both a summary of the research cited, and as a basis for the specification of research hypotheses in Chapter III.

## V. GENERAL HYPOTHESES

The research findings presented in the preceding section suggest a number of general hypotheses regarding the adoption of automatic data processing and the characteristics of the school district, its personnel, and the community in which it operates.

The results of research conducted by Coleman, Katz and Menzel among physicians, by Gross et al. among farmers, and by Carlson among school superintendents suggests that superintendents and business administrators of districts which have adopted ADP will be younger, will have taken more formal education, and taken it more recently, will have been in their present positions for shorter lengths of time, will have held positions in more different organizations and will subscribe to more professional journals than those in districts which have not adopted ADP. This hypothesis also finds support from the research of Carter and Williams in industry.

Industrial research, the Columbia University studies and the work of Carlson suggest that districts which have adopted ADP will have larger enrollments, will have higher expenditures per pupil, and



will have more highly trained and larger education staffs than those which have not. The results of the analysis of adoption of new practices and the degree of specialization of the farm suggests that secondary districts, being more specialized, will be more likely to adopt ADP than unified districts. The Duncan and Kreitlow study suggests that public districts, being more heterogeneous, will be more likely to adopt ADP than denominational districts. There appears to be little empirical evidence for expecting a difference between adopter and non-adopter districts in terms of pupil-staff ratio, per cent of staff male, or years of experience of education staff.

The statement by Kumpf, which summarizes much of the research on community characteristics related to adaptability, suggests that adopter districts are more likely to be situated in large metropolitan area communities than in other urban areas, and that adopter districts will have a higher percentage of community residents Canadian born than non-adopter districts. It also suggests that adopter district school board members, as representatives of the community, will have higher occupational status, and the concomitant income and education, than board members of non-adopter districts.

The research cited in support of hypotheses about the age and tenure of superintendents and business administrators also suggests that adopter board members will be younger and have spent fewer years on the board than non-adopter board members. This search of the literature did not reveal any empirical basis for expecting adopter board



members to differ in sex or method of selection (appointed or elected) from non-adopter board members. Nor did it reveal any basis for expecting adopter boards to have more members than non-adopter boards.





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<sup>18</sup>Ibid., p. 78.

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<sup>25</sup>C. F. Carter and B. R. Williams, "The Characteristics of Technically Progressive Firms," The Journal of Industrial Economics, VII (March, 1959), pp. 87-104.

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<sup>29</sup>Ibid., p. 176.

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<sup>31</sup>Mort, op. cit., pp. 325-326.

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## CHAPTER III

### RESEARCH METHODOLOGY

This chapter describes the procedures used in the development of the questionnaires, and the collection and treatment of the data.

#### I. THE VARIABLES

The variables for this study were defined in the following way.

##### The Dependent Variable

The dependent variable is the adoption of Automatic Data Processing (ADP). For the comparison of adopter and non-adopter districts, the variable is considered as dichotomous with adopter districts defined as indicated in Chapter I (p. 4). For the regression analyses, or the prediction of extent of ADP use, the variable was considered to be continuous with a value equivalent to the number of pupil or business accounting operations the district reported it was performing on ADP equipment.

##### The Independent Variables

The independent variables were grouped as the characteristics of the superintendent, the business administrator, the district, the school board, the school board members, and the community.





Superintendent and business administrator variables. The following superintendent and business administrator variables were chosen.

1. Age.
2. Amount of education--the number of years of post-secondary school, formal education.
3. Recency of education--the year when the individual was last a full-time student subtracted from the current year (1966).
4. Tenure--the number of years the individual had been in his present position.
5. Mobility--for the superintendent, the number of different districts in which he was employed in his present and three preceding positions; for the business administrator, the number of different organizations by whom he was employed in his present and three preceding positions.
6. Professional journals--the number of specified journals reported as regularly read. No credit was given for replies of "etc." or "and many more" or for periodicals judged to be outside the fields of professional education and business.

District variables. The following district variables were chosen.

1. Total student enrollment.
2. Grade nine student enrollment. Grade nine enrollment was arbitrarily chosen as a common basis for the comparison of unified and secondary districts.



3. Expenditure--"the expenditure for the current on-going program, that is all expenditures except capital outlay and debt service,"<sup>1</sup> divided by the total enrollment.

4. Total education staff--the total number of teachers and educational administrators in the district.

5. Pupil-staff ratio--the total enrollment divided by the total education staff.

6. Male per cent of education staff.

7. Mean years of teaching experience of education staff.

8. Mean years of formal, post-secondary education of staff recognized for salary purposes.

9. Enrollment type--unified or secondary as defined in Chapter I (p. 4).

10. Religious type--public or denominational as defined in Chapter I (p. 4).

Board member variables. The following board member variables were chosen.

1. Age.

2. Tenure--the number of years as a board member.

3. Occupation index--T score on the Blishen scale.\*<sup>2</sup>

4. Sex.

5. Selection--elected or appointed.

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\*Blishen developed this scale by ranking and grouping occupations according to combined standard scores for income and years of schooling from the 1951 census of Canada.





Board variables. The following board variables were chosen.

1. Number of members.
2. Mean years tenure as board members.
3. Mean age of board members.
4. Mean occupation index of members--those members whose occupations were not classifiable, such as "retired" or "housewife", were omitted.
5. Male per cent of board membership.
6. Elected per cent of board membership.

Community variables. The following community variables were chosen.

1. Per cent of community residents Canadian born.
2. Community type--metropolitan or non-metropolitan as defined in Chapter I (pp. 4-5).

## II. THE QUESTIONNAIRE

A questionnaire designed to obtain information relevant to the variables and to the survey of ADP use was developed. A California report<sup>3</sup> and an Ontario Association of School Business Officials survey<sup>4</sup> were used as reference material.

One of the purposes of the 1960 California study was a survey of the utilization of data processing equipment by county and district school offices. They found 23 of the 58 counties using data processing equipment. These counties accounted for approximately 67 per cent



of the total enrollment of California public schools. The Ontario survey in 1964 revealed 16 school boards using data processing techniques for 41 different operations.

Minor alterations to the questionnaire were made after its feasibility was tested with the Edmonton Public School Board and members of the Faculty of Business Administration and Commerce of the University of Alberta. With the assistance of students in the Department of Educational Administration, French translations of the questionnaire and all correspondence were developed for the French-speaking districts of Quebec. Appendices A and B are copies of the questionnaires and explanatory letters.

### III. DATA COLLECTION

This section describes the selection of the population and sample for the study, and the primary and secondary sources of data.

#### The Population

Using information obtained from the provincial departments of education, a population of 103 districts was chosen. Selection was based on the following criteria.

1. In view of the following comment in the report of a California pilot project, it was decided that the population would be delimited to those districts enrolling secondary students.

In terms of work involvement, it can be said that in the field of school business there is at least twice as much data processing generated by each student in the secondary





school as there is by each pupil in the elementary school, and that in the field of pupil personnel services there is about three times as much.<sup>5</sup>

2. The district must enroll 2000 or more pupils in grades 9 to 12 inclusive. It was assumed that only the larger districts would find adoption of ADP feasible, and that enrollment of 2000 or more would provide a population of approximately 100 districts.

### Questionnaire Distribution and Collection

The questionnaires were mailed to the superintendents of 103 districts with an accompanying letter and a stamped return envelope. Approximately one month after the distribution of questionnaires, a reminder letter was sent to the superintendents of districts from whom no reply had been received. Approximately one month after the reminder letter, a selected number of the superintendents of the remaining districts were contacted by telephone or by personal letter. Approximately one month after this, the sample was closed and subsequent returns were not included in the study.

### The Sample

Replies were received from 65 of the 103 districts to whom questionnaires were mailed. Of these 65, 58 participated in the study. These 58 districts comprise the sample. Within this sample, information of 56 superintendents, 49 business administrators, 56 school districts, 52 school boards, and 482 board members was returned.





Table I indicates the distribution and return of questionnaires by province. The distribution ranged from a high of 40 in Ontario, to a low of 1 in Newfoundland. The per cent return ranged from a high of 100 per cent from Nova Scotia to a low of 37.5 per cent from Quebec. The sample comprises 56.31 per cent of the population.

### Data Sources

The primary data source for the present study was the returned questionnaires. The nature and amount of information needed for completion of the distributed forms was such that some of the respondents returned incomplete data. Therefore, some of the analyses were applied to a total number of cases fewer than the complete sample of 58.

The data for the community variables were obtained from the 1961 Census of Canada.<sup>6</sup> The per cent of residents Canadian born was obtained by dividing the number of residents of the district born in Canada by the total population of the district and multiplying by 100. Districts which lay within the boundaries of the major metropolitan areas, as defined for the census, were called metropolitan districts. All others were called non-metropolitan. Again, the data available were limited to those districts whose boundaries were coterminous with census divisions.

## IV. STATISTICAL TREATMENT

This section describes in detail how the data were organized and stored, and how the sample was examined for bias. It also specifies



TABLE I  
DISTRIBUTION AND RETURN OF QUESTIONNAIRES  
BY PROVINCE

Province*	Number of questionnaires distributed	Number of questionnaires returned	Per cent of questionnaires returned
B. C.	15	6	40.00
Alberta	7	5	71.43
Sask.	3	2	66.67
Manitoba	9	6	66.67
Ontario	40	27	67.50
Quebec	24	9	37.50
N. B.	2	1	50.00
N. S.	2	2	100.00
Nfld.	1	0	0.00
Total	103	58	56.31

\* None of the districts in Prince Edward Island was of sufficient size to be included in the population.





the research hypotheses, and the procedures used in adapting and examining the data for the prediction of the extent of adoption of ADP.

### Data Organization

The raw data were entered on punch cards, verified and analyzed by programs developed by the Division of Educational Research Services using facilities of that Division and of the Department of Computing Science at the University of Alberta.

### Examination of the Sample for Bias

The scientific investigator must be eternally vigilant to the possibility of biased sampling. A good, systematic control of experimental conditions is designed to prevent biased samples or to make known their effects. Where there is less than customary experimental control of the observations, every possible effort should be made to know the conditions under which the data are obtained. Thorough knowledge of the conditions should be a basis for deciding whether selection of cases has been biased.<sup>7</sup>

The sample was examined for the possibility of bias in the following manner. As the questionnaires were returned, they were placed in the return group categories as follows:

Group 1--those districts whose superintendents or business administrators returned questionnaires before reminder letters were sent.

Group 2--those districts which replied after the first reminder.

Group 3--those districts which replied after the second reminder.

It was assumed that if biasing forces were prevalent in the sample



they would appear in the comparison of the return groups on the superintendent, business administrator, district and community variables.

As the examination of the sample for bias is not an integral part of the study, complete results are not presented here. Appendix C (Tables XXXIV to XLV) presents the results of the analyses which compare the return groups.

The examination of the return groups was done by comparing the mean of each of the continuous variables for each pair of return groups (Group 1 vs. Group 2; Group 1 vs. Group 3; Group 2 vs. Group 3). The comparison was done by using t-tests for the difference of means of two independent samples.<sup>8</sup> The F-test for homogeneity of variance<sup>9</sup> was applied to each variable and the Welch<sup>10</sup> correction for lack of homogeneity of variance was applied when the probability of obtaining the F ratio was less than .10. For each t-test the probability level of five percent ( $p \leq .05$ ) was accepted as significant.

The comparison of superintendents in each return group on the six superintendent variables involved eighteen t-tests. Of these, one revealed a significant difference between return group superintendents. The mean years tenure of Group 1 superintendents was significantly different from the mean years tenure of Group 3 superintendents at the .01 level of probability.

The eighteen t-tests in the comparison of return groups of business administrators also revealed one significant difference. The mean years tenure of Group 1 business administrators was





significantly different from the mean years tenure of Group 3 business administrators at the .05 level of probability.

The comparison of the return groups on the nine district and community continuous variables involved 27 t-tests. None of these resulted in a significant difference, at the .05 level, between return groups on any of the variables.

Sixty-three t-tests were used in the analyses of the return groups on the continuous variables. Two of these revealed significant differences between return groups at the .05 level of probability. Having 2 of 63 tests reveal significant differences between return groups has a probability of greater than .05 of being the result of chance. Therefore, these tests were deemed to present insufficient evidence for rejection of the assumption that there were no significant differences between the return groups on the continuous variables.

It should be noted, however, that the two significant differences that were found were on the same characteristic of superintendents and business administrators--years tenure. This suggests the possibility of a biased sample of superintendents and business administrators on the tenure variable. In the case of both superintendents and business administrators, return Group 1 tended to have a higher mean years tenure than Group 3. That is, more recently appointed superintendents and business administrators appear to be more reluctant to return information on themselves and/or their districts.

Further examination of the return groups was done by applying





the chi square test for independence<sup>11</sup> of the return groups and each district and community dichotomous variable, with the probability level of .05 accepted as significant.

The tests for independence of return group and enrollment type, return group and religious type, and return group and community type did not reveal any significant associations at the .05 level of probability. Therefore, these tests were deemed to present insufficient evidence for rejection of the assumption that there were no significant differences between the return groups on the dichotomous variables.

The acceptance of these assumptions suggests that there are no significant differences among the three return groups. There appears to be some logical basis for concluding from these assumptions that the districts which returned questionnaires did not differ greatly, on the 21 variables examined, from those districts which did not return questionnaires.

The significant difference between return groups of superintendents and business administrators on the tenure variable suggests that the sample may be biased on the two tenure variables and those variables related to them. Therefore, further analysis of these variables must be interpreted cautiously.

### Research Hypotheses

The hypotheses for the comparative analyses of adopter and non-adopter districts were the following.



Superintendent Null Hypotheses. Adopter superintendents do not differ significantly from non-adopter superintendents on the following variables.

1.1 mean age.

1.2 mean amount of education.

1.3 mean recency of education.

1.4 mean years tenure.

1.5 mean mobility.

1.6 mean number of professional journals.

Superintendent Alternate Hypotheses. Adopter superintendents differ significantly from non-adopter superintendents on the following variables.

1.1 mean age.

1.2 mean amount of education.

1.3 mean recency of education.

1.4 mean years tenure.

1.5 mean mobility.

1.6 mean number of professional journals.

Business Administrator Null Hypotheses. Adopter business administrators do not differ significantly from non-adopter business administrators on the following variables.

2.1 mean age.

2.2 mean amount of education.

2.3 mean recency of education.

2.4 mean years tenure.





2.5 mean mobility.

2.6 mean number of professional journals.

Business Administrator Alternate Hypotheses. Adopter business administrators differ significantly from non-adopter business administrators on the following variables.

2.1 mean age.

2.2 mean amount of education.

2.3 mean recency of education.

2.4 mean years tenure.

2.5 mean mobility.

2.6 mean number of professional journals.

District Null Hypotheses. Adopter districts do not differ significantly from non-adopter districts on the following variables.

3.1 mean total enrollment.

3.2 mean grade nine enrollment.

3.3 mean expenditure.

3.4 mean total education staff.

3.5 mean pupil-staff ratio.

3.6 mean male per cent of education staff.

3.7 mean years experience of education staff.

3.8 mean years training of education staff.

3.9 enrollment type.

3.10 religious type.

District Alternate Hypotheses. Adopter districts differ



significantly from non-adopter districts on the following variables.

3.1 mean total enrollment.

3.2 mean grade nine enrollment.

3.3 mean expenditure.

3.4 mean total education staff.

3.5 mean pupil-staff ratio.

3.6 mean male per cent of education staff.

3.7 mean years experience of education staff.

3.8 mean years training of education staff.

3.9 enrollment type.

3.10 religious type.

Board Member Null Hypotheses. Adopter board members do not differ significantly from non-adopter board members on the following variables.

4.1 mean age.

4.2 mean years tenure.

4.3 mean occupation index.

4.4 sex.

4.5 selection.

Board Member Alternate Hypotheses. Adopter board members differ significantly from non-adopter board members on the following variables.

4.1 mean age.

4.2 mean years tenure.

4.3 mean occupation index.



4.4 sex.

4.5 selection.

Board Null Hypotheses. Adopter boards do not differ significantly from non-adopter boards on the following variables.

5.1 mean number of members.

5.2 mean per cent of members elected.

5.3 mean per cent of members male.

5.4 mean age of members.

5.5 mean years tenure of members.

5.6 mean occupation index of members.

Board Alternate Hypotheses. Adopter boards differ significantly from non-adopter boards on the following variables.

5.1 mean number of members.

5.2 mean per cent of members elected.

5.3 mean per cent of members male.

5.4 mean age of members.

5.5 mean years tenure of members.

5.6 mean occupation index of members.

Community Null Hypotheses. Adopter communities do not differ significantly from non-adopter communities on the following variables.

6.1 mean per cent of residents Canadian born.

6.2 community type.

Community Alternate Hypotheses. Adopter communities differ significantly from non-adopter communities on the following variables.





6.1 mean per cent of residents Canadian born.

6.2 community type.

### Research Hypothesis Testing

All hypotheses, with the exception of 3.9, 3.10, 4.4, 4.5, and 6.2, were tested by applying the t-test for the difference of means of two independent samples.<sup>12</sup> The F-test for homogeneity of variance<sup>13</sup> was applied to each variable and the Welch correction<sup>14</sup> for lack of homogeneity of variance was applied when the probability of obtaining the F ratio was less than .10. For each t-test the probability level of five per cent ( $p \leq .05$ ) was accepted as significant.

Hypotheses 3.9, 3.10, 4.4, 4.5, and 6.2 were tested by applying the chi square test for independence<sup>15</sup> of the dependent variable and the district, community and board member dichotomous variables. The Yates correction for continuity<sup>16</sup> was applied where any of the expected frequencies was less than five.

### Prediction of the Extent of Adoption of ADP

Multiple regression analysis<sup>17</sup> was used to determine which independent variables best predicted the extent of adoption of ADP. However, predicting extent of adoption from a sample of 14 districts using 30 variables was judged inappropriate, in view of the fact that the mathematical model upon which multiple regression analysis is based requires that the total of the independent and dependent



variables be 2 less than the sample size. Therefore, it was necessary to select 11 independent variables from the 30 used in the comparison analyses.

Guilford suggests that the criteria for selecting predictor variables for multiple regression are (1) the variable should have a high correlation with the criterion variable, and (2) it should have low intercorrelations with the other independent variables.<sup>18</sup> He further states:

Where there has to be a choice, it seems wisest to give less attention to the first principle (maximizing correlation . . . with the criterion) and greater attention to the second (minimizing intercorrelations).<sup>19</sup>

The selection of prediction variables, using these criteria, is described in detail with the results of the multiple regression prediction in Chapter VI.

## V. SUMMARY

The purpose of this chapter was to outline the elements in the research design. The dependent variable chosen was the adoption of automatic data processing. There were 35 independent variables chosen. These were variables representing the characteristics of superintendents, business administrators, districts, board members, boards, and communities.

A questionnaire designed to gather information relevant to the independent and dependent variables was developed and distributed to 103 large districts across Canada. The return sample was examined





for the possibility of bias. The examination of the sample appeared to present some logical basis for concluding that the 58 districts were an unbiased sample of the population.

Using the literature and research reviewed in Chapter II, research hypotheses, in the form of null and alternate hypotheses, were stated. The statistical analyses used to test these hypotheses involved primarily t-tests for the difference of means of two independent samples, and chi square tests for independence of nominal variables. The prediction of the extent of the adoption of ADP was conducted by using multiple regression analysis.

The results of the statistical analysis of the returned data are presented in Chapter V and VI.



### REFERENCES FOR CHAPTER III

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- <sup>2</sup>Bernard R. Blishen, et al. (eds.), Canadian Society: Sociological Perspectives (Toronto: The Macmillan Company of Canada, 1961), pp. 481-485.
- <sup>3</sup>California State Department of Education, A Report of a Study--Processing Pupil Personnel Data (Bulletin of The California State Department of Education, XXXI March, 1962), pp. 65-69.
- <sup>4</sup>James Nuttall, " 'Walk Before Your Run'- Key to Data Processing Planning," School Progress, XXXIV (November, 1965), pp. 8-9.
- <sup>5</sup>Educational Systems Corporation, A Report of an Experiment--The State Pilot Project in Educational Data Processing (Santa Monica, California: Educational Systems Corporation, 1964), p. 35.
- <sup>6</sup>Dominion Bureau of Statistics, 1961 Census of Canada, (Ottawa: Queen's Printer, 1962), Tables 52.1-56.2.
- <sup>7</sup>J. P. Guilford, Fundamental Statistics in Psychology and Education (fourth edition; New York: McGraw-Hill Book Company, Inc., 1965), p. 140.
- <sup>8</sup>George A. Ferguson, Statistical Analysis in Psychology and Education (New York: McGraw-Hill Book Company, Inc., 1959), pp. 136-138.
- <sup>9</sup>Ibid., pp. 140-142.
- <sup>10</sup>Ibid., pp. 144-145.
- <sup>11</sup>Ibid., pp. 165-169.
- <sup>12</sup>Ibid., pp. 136-138.
- <sup>13</sup>Ibid., pp. 140-142.



<sup>14</sup>Ibid., pp. 144-145.

<sup>15</sup>Ibid., pp. 165-169.

<sup>16</sup>Ibid., pp. 171-172.

<sup>17</sup>Guilford, op. cit., pp. 392-437.

<sup>18</sup>Ibid., pp. 407-408.

<sup>19</sup>Ibid., p. 408.





## CHAPTER IV

### DESCRIPTION OF THE SAMPLE

This study involves analysis of the characteristics of 58 school districts in relation to the adoption and extent of adoption of automatic data processing. Interpretation of the findings depends upon a knowledge of the sample being analysed.

This chapter describes the characteristics of the superintendents, business administrators, districts, communities, boards, and board members comprising the sample.

#### I. SUPERINTENDENTS

Table II shows the range, mean and standard deviation of each variable for the superintendents comprising the sample.

The sample superintendents had a mean age of 53.91, and their ages ranged from 32 to 66. The amount of post-secondary education they had undertaken ranged from 4 to 9 years, with a mean of 6.25. The number of years since the superintendents in the sample were full-time students ranged from 2 to 35 with a mean of 14.40. One superintendent had been in office 29 years, others had been appointed within the current year. The mean years tenure was 7.27. The mean mobility index was 2.47 and ranged from 1 to 4, whereas the number of professional journals regularly read ranged from zero to 9 with a mean of 5.07.



TABLE II  
CHARACTERISTICS OF SUPERINTENDENTS  
COMPRISING THE SAMPLE

Variable	N	Range	Mean	S.D.
Age	56	32-66	53.91	6.73
Amount of education	56	4-9	6.25	1.35
Recency of education	53	2-35	14.40	8.25
Tenure	55	1-29	7.27	5.85
Mobility	55	1-4	2.47	1.20
Professional journals	54	0-9	5.07	2.27





## II. BUSINESS ADMINISTRATORS

The characteristics of business administrators comprising the sample are displayed in Table III.

The ages of business administrators ranged from 35 to 68 with a mean of 47.71. Their amount of formal post-secondary education had a mean of 3.10 years with a high of 8 years and a low of zero. The recency of education ranged from 1 to 44 years with a mean of 20.44. The mean years tenure was 9.06 and ranged from 1 to 35 years. As with superintendents, mobility and professional journal variables of business administrators ranged from 1 to 4 and zero to 9 respectively. Business administrators, however, had a mean mobility index of 2.46 and a mean number of professional journals of 3.72.

## III. DISTRICTS AND COMMUNITIES

As can be seen in Table IV, the districts comprising the sample ranged in size from a high of 105,256 pupils to a low of 1,900. The mean enrollment of the districts in the sample was 17,797.55. Grade nine enrollment in the sample districts ranged from 365 to 8,993 with a mean of 1,760.61. The mean per pupil expenditure was \$485.34 per year and ranged from \$204 to \$982. The largest education staff was 4,480 and the smallest 84. The mean education staff was 781.63.

The sample districts had a pupil-staff ratio which ranged from 15.5 to 32.6 with a mean of 22.31. The mean per cent of staff male



TABLE III  
CHARACTERISTICS OF BUSINESS ADMINISTRATORS  
COMPRISING THE SAMPLE

Variable	N	Range	Mean	S.D.
Age	47	35-68	47.71	7.98
Amount of education	48	0-8	3.10	2.00
Recency of education	34	1-44	20.44	11.75
Tenure	48	1-35	9.06	6.59
Mobility	46	1-4	2.46	1.06
Professional journals	47	0-9	3.72	2.50



TABLE IV

CHARACTERISTICS OF DISTRICTS AND COMMUNITIES  
COMPRISING THE SAMPLE

Variable	N	Range	Mean	S.D.
Total enrollment	56	1,100-105,256	17,797.55	20,829.57
Grade nine enrollment	54	365-8,993	1,760.61	1,671.13
Expenditure (\$)	38	204-982	485.34	144.35
Total education staff	49	84-4,480	781.63	920.49
Pupil-staff ratio	47	15.5-32.6	22.31	3.05
% of staff male	37	20-74	45.68	13.45
Mean yrs. exp. of ed. staff	28	5.0-14.0	8.09	2.60
Mean yrs. training of ed. staff	27	1.7-4.6	3.37	0.68
% of residents Canadian born	47	58-98	79.64	8.42





was 45.68 and ranged from 20 to 74. The mean years training of staff, and the mean years experience of staff were respectively 3.37 and 8.09 years, and the respective ranges were 1.7 to 4.6 years and 5.0 to 14.0 years.

The communities in the sample had a per cent of residents Canadian born which ranged from 58 to 98 with a mean of 79.64.

Tables V and VI illustrate the number and per cent of districts by enrollment and religious type. Of the districts reporting enrollment type, 39 were unified and the remaining 14, or 26.42 per cent, were secondary. The sample of 58 included 50 public and 8 denominational districts.

Table VII shows that 53.45 per cent, or 31, of the 58 districts were in metropolitan areas and the remainder of 46.55 per cent were in non-metropolitan areas.

#### IV. BOARD MEMBERS

Board members in the sample had a mean age of 49.53 and ranged in age from 29 to 82. As can be seen in Table VIII, board members ranged from 1 to 37 years as their community representatives, and had a mean years tenure of 5.98. Their mean occupation index on the Blishen scale was 63.01, and ranged from 42.8 to 82.5.

Tables IX and X indicate the number of board members by sex and selection. Of the sample of 482 board members, 412 or 85.48 per cent were male. Those board members whose method of selection was



TABLE V  
NUMBER AND PER CENT OF DISTRICTS  
COMPRISING THE SAMPLE,  
BY ENROLLMENT TYPE

Type	Number	Per cent
Unified	39	73.58
Secondary	14	26.42
Total	53	100.00





TABLE VI  
NUMBER AND PER CENT OF DISTRICTS  
COMPRISING THE SAMPLE,  
BY RELIGIOUS TYPE

Type	Number	Per cent
Public	50	86.21
Denominational	8	13.79
Total	58	100.00



TABLE VII  
NUMBER AND PER CENT OF DISTRICTS  
COMPRISING THE SAMPLE,  
BY COMMUNITY TYPE

Type	Number	Per cent
Metropolitan	31	53.45
Non-metropolitan	27	46.55
Total	58	100.00



TABLE VIII  
CHARACTERISTICS OF BOARD MEMBERS  
COMPRISING THE SAMPLE

Variable	N	Range	Mean	S.D.
Age	247	29-82	49.53	10.33
Tenure	441	1-37	5.98	4.89
Occupation index	419	42.8-82.5	63.01	10.47





TABLE IX  
NUMBER AND PER CENT OF BOARD MEMBERS  
COMPRISING THE SAMPLE, BY SEX

Sex	Number	Per cent
Male	412	85.48
Female	70	14.52
Total	482	100.00



TABLE X

NUMBER AND PER CENT OF BOARD MEMBERS  
COMPRISING THE SAMPLE,  
BY SELECTION

Selection	Number	Per cent
Elected	335	73.30
Appointed	122	26.70
Total	457	100.00





reported totalled 457. Of these, 335 were elected and 122 were appointed to their respective boards.

## V. BOARDS

There were 52 school boards included in the sample. These boards ranged in size from 5 to 22 members with a mean of 9.75. The per cent of members elected ranged from zero to 100 with a mean per cent elected of 76.10. It should be noted that 25 of the boards were composed completely of elected members, but only 7 were composed wholly of appointed members.

As Table XI indicates, the mean per cent of board members male was 85.04 and ranged from 60 to 100 per cent. The mean age of members of the sample boards ranged from 41 to 58 with a mean of 49.59. The mean years tenure of board members ranged from 2 to 13 with a mean of 5.89, and the mean occupation index ranged from 50.0 to 76.9 with a mean of 63.00. It is important to note that the means of the latter three board variables are almost identical to the respective three board member variables presented in Table VIII.

## VI. RELATIONSHIPS BETWEEN VARIABLES

Table XLVI (Appendix D) is an intercorrelation matrix of the 30 variables used in the present study. A probability level of less than or equal to .05 was accepted as indicating a significant relationship between variables.



TABLE XI  
CHARACTERISTICS OF BOARDS  
COMPRISING THE SAMPLE

Variable	N	Range	Mean	S.D.
Number of members	52	5-22	9.75	3.74
% of members elected	52	0-100	76.10	36.42
% of members male	51	60-100	85.04	13.87
Mean age of members	26	41-58	49.69	4.01
Mean years tenure of members	47	2-13	5.89	2.54
Mean occupation index of members	50	50.0-76.9	63.00	5.61



### Intra-group Relationships

A number of significant relationships appeared within the groups of superintendent, business administrator, district, and board variables.

Superintendent's age was significantly correlated with his recency of education and tenure in the positive direction, and in the negative direction with his mobility. And the superintendent's recency of education had a significant positive correlation with his tenure.

The business administrator's age correlated significantly and positively with his recency of education and his tenure. His amount of education was positively correlated with the number of professional journals at a significant level.

There were a number of significant correlations between pairs of district variables. There were significant and positive correlations between total enrollment and grade nine enrollment, and between total enrollment and total education staff. There were significant and negative correlations between total enrollment and enrollment type, and total enrollment and per cent of staff male. There was a positive, significant correlation between grade nine enrollment and total education staff. There were significant, positive correlations between enrollment type and expenditure, and per cent of staff male, and there were significant, negative correlations between enrollment type and both total education staff and pupil-staff ratio. There was





a significant and negative correlation between expenditure and pupil-staff ratio. And per cent of staff male correlated significantly and negatively with total education staff.

There was a significant, negative correlation between the number of board members and the per cent of members elected. The mean years tenure of board members was positively correlated with the mean age of board members at a significant level.

The relationships among the superintendent variables of age, recency of education, tenure, and mobility suggests that these variables represent a single characteristic of the superintendents comprising the sample. Interpretation of subsequent analyses of these variables should take into account the relationships among them. Similar caution must be exercised in interpretation of the analyses of the business administrator's age, recency of education and tenure variables, because of the relationships among them.

There were significant relationships among seven of the ten district variables in the correlation matrix. Total enrollment, enrollment type, per cent of staff male, and total education staff were significantly intercorrelated with three or more of the district variables and grade nine enrollment, expenditure, and pupil-staff ratio were significantly correlated with two. These variables appear to be related to a size factor and must not be interpreted as representing discrete characteristics.



### Inter-group Relationships

In addition to the correlations within the groups of variables, there were a number of significant relationships between variables in different groups.

There were significant, negative correlations between the superintendent's age and enrollment type, religious type, and mean occupation index of board members. The superintendent's tenure had a significant, negative correlation with the mean years training of the education staff, district enrollment type, religious type, and per cent of board members male, and the number of professional journals he read correlated significantly with the mean years experience of the education staff in the positive direction and with the per cent of community residents Canadian born in the negative direction.

The business administrator's age had a significant, positive correlation with community type. His mobility was significantly correlated with the district's total enrollment, grade nine enrollment, and total education staff in the negative direction. His tenure had significant, positive correlations with community type, mean occupation index of board members, and mean years experience of education staff. And his amount of education correlated positively with total staff and pupil-staff ratio, and negatively with per cent of staff male and community type at a significant level.

The number of board members was significantly correlated with total enrollment, grade nine enrollment, expenditure, and total







education staff in the positive direction. The per cent of board members elected correlated positively with the superintendent's mobility and the district pupil-staff ratio at a significant level, and with the business administrator's age, and recency of education, and the district's enrollment type, expenditure, and per cent of staff male at a significant level, in the negative direction. The per cent of board members male correlated positively with district enrollment type, expenditure, per cent of education staff male, and religious type at the .05 level, and negatively with the superintendent's tenure and mobility. The mean age of board members was positively, and significantly, correlated with the superintendent's amount of education, and negatively with the business administrator's number of professional journals. The mean occupation index of board members was negatively correlated with enrollment type, per cent of staff male and religious type, and positively with superintendent tenure and business administrator professional journals. The mean years tenure of board members was negatively correlated with religious type.

Per cent of residents Canadian born was significantly correlated with total enrollment, grade nine enrollment, total educational staff, per cent of board members elected, and number of board members in the negative direction, and with enrollment type and religious type in the positive direction. Community type was significantly correlated with total enrollment, grade nine enrollment, and



total education staff in the negative direction, and with per cent of staff male, and per cent of board members male in the positive direction.

Although the relationships described in the preceding paragraphs are worthy of further clarification, interpretation and discussion, it is not the purpose of this study to examine these relationships per se. However, the appearance of significant correlations among variables in different groups suggests that not only must care be taken in interpretation of the findings on the analysis of variables within groups, but also interpretations of findings of all the variables must be made in view of the total matrix of related variables. That is to say, a significant difference between adopters and non-adopters of ADP found on any of the aforementioned variables may not be a difference on that variable itself, but may in fact be a reflection of differences due to other variables to which it is related.

In conclusion it should be noted that an intercorrelation matrix of 30 variables contains 435 correlation coefficients. Using a probability level of 5 per cent, one would expect 22 of these coefficients to be significant at the .05 level as a result of chance alone. Or using a probability level of 1 per cent, one would expect 4 of the coefficients to be significant at the .01 level as a result of chance. Table XLVI contains 82 coefficients significant at the .05 level. Of these, 33 are significant at the





.01 level. Without further analysis or evidence, one can merely speculate as to which of these relationships occur purely as a result of chance.

## VII. SUMMARY

This chapter describes the characteristics of superintendents, business administrators, districts, communities, boards, and board members in the sample by presenting the range, mean, and standard deviation of each of the variables used in the study. It also includes a description of the relationships existent between variables for members of the sample.





## CHAPTER V

### CHARACTERISTICS OF ADP ADOPTERS

The purpose of this chapter is to present the results of the analyses which compare ADP adopter and non-adopter districts, performed as described in Chapter III.

#### I. SUPERINTENDENTS

Table XII presents the results of the comparison of adopter and non-adopter superintendents. None of the differences between means of adopters and non-adopters on the six superintendent variables was significant at the .05 level of probability.

Of the six variables, mobility was the only one which indicated a difference which approached significance. The difference between the means of adopter and non-adopter superintendents on the mobility variable had the probability of occurring as a result of chance at the .15 level. The tendency indicated was for non-adopters to be more mobile than adopters. This appears contrary to the findings of Carlson. He found the origin of the superintendent (whether promoted to the position from inside or outside the school system) as both the best predictor of rate of adoption and the highest correlative of rate of adoption in Allegheny county. His study indicated that "outsiders" were more likely to adopt innovations than "insiders".<sup>1</sup>



TABLE XII

COMPARISON OF ADOPTER AND NON-ADOPTER  
SUPERINTENDENTS BY CHARACTERISTICS

Variable	Adopters		Non-adopters		t	level of probability
	N	Mean	S.D.	N	Mean	S.D.
Age	14	55.00	5.94	42	53.55	6.93
Amount of education	14	6.14	1.46	42	6.29	1.31
Recency of education	12	14.00	9.89	41	14.51	7.71
Tenure	14	7.43	6.03	41	7.22	5.79
Mobility	14	2.07	0.96	41	2.61	1.25
Professional journals	13	5.46	2.65	41	4.95	2.12
					0.70	0.489





These results did not present sufficient evidence for the rejection of the superintendent null hypotheses at the .05 level. The hypotheses that "adopter superintendents do not differ significantly from non-adopter superintendents in mean age, mean amount of education, mean recency of education, mean years tenure, mean mobility, and mean number of professional journals," were accepted.

## II. BUSINESS ADMINISTRATORS

The results of the comparison of adopter and non-adopter business administrators are presented in Table XIII.

Comparison of adopters and non-adopters on the six business administrator variables revealed a difference in mobility at the .005 level of probability. The tendency here was for non-adopters to be more mobile than adopters. This was again contrary to the hypothesis based on Carlson's research. However, the correlations of the business administrator's mobility with the variables related to the size of the school system suggests that mobility is related to the size of the district as well as to the adoption of ADP. Similarly, no data were available as to whether this mobility index was representative of voluntary or involuntary moves, promotions or demotions, or moves to larger or smaller districts.

It should be noted that the difference between adopter and non-adopter business administrators on the amount of education variable approaches significance, having a probability of .11. This



TABLE XIII  
COMPARISON OF ADOPTER AND NON-ADOPTER BUSINESS  
ADMINISTRATORS BY CHARACTERISTIC

Variable	Adopters		Non-adopters		t	Probability level		
	N	Mean	S.D.	N			Mean	S.D.
Age	10	48.20	7.65	39	47.59	8.06	0.21	0.834
Amount of education	10	3.70	1.00	38	2.95	2.16	1.59 <sup>a</sup>	0.114 <sup>a</sup>
Recency of education	7	18.57	9.18	27	20.93	12.28	0.46	0.649
Tenure	10	8.80	3.40	38	9.13	7.19	0.21 <sup>a</sup>	0.835 <sup>a</sup>
Mobility	9	1.56	0.83	37	2.68	0.99	3.07	0.004 <sup>b</sup>
Professional journals	10	3.90	2.59	37	3.68	2.47	0.25	0.806

<sup>a</sup>Corrected by the Welch approximation for lack of homogeneity of variance.

<sup>b</sup>Significant at the .005 level.



variable indicated that adopter business administrators tend to have more post-secondary education than non-adopters. This is consistent with the findings of Gross and Carlson cited in Chapter II.

This analysis presented sufficient evidence for rejection of business administrator null hypothesis 2.5, but presented insufficient evidence for the rejection of any of the remaining business administrator null hypotheses. Therefore, the hypotheses that, "adopter business administrators do not differ significantly from non-adopter business administrators in mean age, mean amount of education, mean recency of education, mean years tenure, and mean number of professional journals," and that "adopter business administrators differ significantly from non-adopter business administrators in mean mobility," were accepted.

### III. DISTRICTS AND COMMUNITIES

Comparison of adopters and non-adopters on nine district and community variables is shown in Table XIV. This analysis revealed a significant difference between adopters and non-adopters at the .001 level of probability on three variables. They were total enrollment, grade nine enrollment, and total education staff.

Two additional variables approached significance as shown in Table XIV. Per cent of staff male and per cent of residents Canadian born show differences between adopter and non-adopter districts which approach significance having probabilities of .06 and .08 respectively.





TABLE XIV

COMPARISON OF ADOPTER AND NON-ADOPTER DISTRICTS  
AND COMMUNITIES BY CHARACTERISTIC

Variable	Adopters			Non-adopters			t	Probability level
	N	Mean	S.D.	N	Mean	S.D.		
Total enrollment	14	40,443.43	29,714.65	42	10,248.93	7,499.84	3.76 <sup>a</sup>	0.000 <sup>ab</sup>
Grade nine enrollment	14	3,309.50	2,267.84	40	1,218.50	914.58	3.36 <sup>a</sup>	0.001 <sup>ab</sup>
Expenditure (\$)	11	489.73	130.88	27	483.56	149.46	0.12	0.908
Total education staff	12	1,813.00	1,297.83	37	447.14	344.88	3.61 <sup>a</sup>	0.000 <sup>ab</sup>
Pupil-staff ratio	12	22.41	1.93	35	22.27	3.34	0.13	0.896
% staff male	11	39.27%	9.65	26	48.38	13.90	1.93	0.062
Mean experience of staff	7	7.83	1.61	21	8.18	2.85	0.30	0.770
Mean training of staff	8	3.53	0.57	19	3.31	0.71	0.73	0.473
% residents Canadian born	12	75.92%	9.17	35	80.91	7.74	1.80	0.079

<sup>a</sup>Corrected by the Welch approximation for lack of homogeneity of variance.<sup>b</sup>Significant at the .001 level.



It should be noted that these five variables do not represent five discrete characteristics. As indicated in Chapter IV, these variables are interrelated, as shown by the significant correlations among them. However, these tests clearly indicate the tendency of adopter districts to be larger than non-adopters in total and equalized enrollment, and total education staff. This result is again consistent with the research findings of Carlson.

These analyses also indicate the tendency for adopter districts to have a smaller percentage of staff male and a smaller percentage of community residents Canadian born than non-adopter districts. The latter result is contrary to the findings reported by Kumpf in Chapter II. However, the significant correlations between this variable and total and grade nine enrollment, and total education staff suggest that the per cent of residents Canadian born may be but indirectly related to adoption of ADP, through the "size" factor. The significant correlations between per cent of staff male and both total enrollment and total education staff suggest a conclusion similar to that reached for per cent of residents Canadian born.

Tables XV and XVI reveal that there was no significant association between whether a district was an adopter or a non-adopter of ADP and the district enrollment type or religious type.

These analyses were deemed to present insufficient evidence for the rejection of district null hypotheses 3.3, 3.5, 3.6, 3.7, 3.8,





TABLE XV  
CHI SQUARE TEST FOR INDEPENDENCE OF  
ADOPTER OR NON-ADOPTER DISTRICTS  
AND ENROLLMENT TYPE

Enrollment Type	Adopters	Non-adopters	Total
Unified	13	26	39
Secondary	1	13	14
Total	14	39	53
Chi square = 2.414 <sup>a</sup> (not significant)			

<sup>a</sup>Adjusted by Yates correction for continuity.



TABLE XVI

CHI SQUARE TEST FOR INDEPENDENCE OF  
ADOPTER OR NON-ADOPTER DISTRICTS  
AND RELIGIOUS TYPE

Religious type	Adopters	Non-adopters	Total
Public	13	37	50
Denominational	1	7	8
Total	14	44	58
Chi square = 0.146 <sup>a</sup> (not significant)			

<sup>a</sup> Adjusted by Yates correction for continuity.



3.9, and 3.10 at the .05 level. However, there appeared to be sufficient evidence for rejection of district null hypotheses 3.1, 3.2, and 3.4 at the .05 level. The hypotheses that "adopter districts do not differ significantly from non-adopter districts in mean expenditure, mean pupil-staff ratio, mean percent staff male, mean years experience of staff, mean years training of staff, enrollment type, and religious type," and that "adopter districts differ from non-adopter districts in mean total enrollment, mean grade nine enrollment, and mean total education staff," were accepted.

Table XVII indicates an association between whether a district is an adopter or non-adopter and whether it is metropolitan or non-metropolitan. The indicated tendency is that metropolitan areas include a higher proportion of adopter districts than do non-metropolitan areas. This is consistent with the research summarized by Kumpf and cited in Chapter II, and, as with other variables which differentiate between adopters and non-adopters, must be cautiously interpreted because of the significant correlations between community type and the previously indicated size variables.

These analyses were deemed to present insufficient evidence for the rejection of community null hypothesis 6.1, but sufficient evidence for the rejection of hypothesis 6.2. The hypotheses that "adopter communities do not differ significantly from non-adopter communities in mean per cent of residents Canadian born," and that "adopter districts differ significantly from non-adopter districts





TABLE XVII  
CHI SQUARE TEST FOR INDEPENDENCE OF  
ADOPTER OR NON-ADOPTER DISTRICTS  
AND COMMUNITY TYPE

Community type	Adopters	Non-adopters	Total
Metropolitan	11	20	31
Non-metropolitan	3	24	27
Total	14	44	58
Chi square = 4.688 (significant at the .05 level)			



in community type," were accepted.

#### IV. BOARD MEMBERS

As can be seen in Table XVIII, none of the comparisons of board members on the continuous variables revealed significant differences between adopter and non-adopter board members at the .05 level. However, tenure and occupation index approach significance, having probabilities of .10 and .06 respectively. Adopter board members tend to rank higher on the Blishen occupation scale than do non-adopters, and tend to have been board members longer than non-adopters. The former result is consistent with the research summarized by Kumpf. The latter result, however, tends to be inconsistent with the inferences taken from Carlson's findings which indicated the tendency for innovators to have shorter tenure than others.

Tables XIX and XX indicate no significant associations between the dependent variable (adoption of ADP) and board member sex or selection.

These analyses were deemed to present insufficient evidence for rejection of the board member null hypotheses at the .05 level. Therefore, the hypotheses that "adopter board members do not differ significantly from non-adopter board members in mean age, mean years tenure, mean occupation index, sex and selection," were accepted. It should be noted that the analyses of the board member variables





TABLE XVIII

COMPARISON OF ADOPTER AND NON-ADOPTER  
BOARD MEMBERS BY CHARACTERISTIC

Variable	Adopters		Non-adopters		t	Probability level
	N	Mean	S.D.	N	Mean	S.D.
Age	42	49.14	11.48	205	49.61	10.07
Tenure	132	6.68	6.33	309	5.68	5.67
Occupation index	126	64.51	10.51	293	62.37	10.39



TABLE XIX  
CHI SQUARE TEST FOR INDEPENDENCE  
OF ADOPTER OR NON-ADOPTER  
BOARD MEMBERS AND SEX

Sex	Adopters	Non-adopters	Total
Male	127	285	412
Female	22	48	70
Total	149	333	482
Chi square = 0.010 (not significant)			



TABLE XX

CHI SQUARE TEST FOR INDEPENDENCE OF  
ADOPTER OR NON-ADOPTER BOARD  
MEMBER AND SELECTION

Selection	Adopters	Non-adopters	Total
Elected	102	233	335
Appointed	34	88	122
Total	136	321	457
Chi square = 0.283 (not significant)			





used weighted means. That is, no attempt was made to take into account the fact that the number of members on the board examined ranged from 5 to 22. This variation in board size would tend to confound the results of the comparisons. Therefore, a further analysis was conducted by comparing school boards using, in part, the characteristics of board members.

## V. BOARDS

Table XXI presents the results of the comparison of adopter and non-adopter boards. The difference between the number of members of adopter and non-adopter boards was significant at the .05 level. The tendency indicated was for adopter boards to have more members than non-adopter boards.

The difference between the mean occupation index of adopter and non-adopter boards approaches significance, having a probability of .19. The tendency for adopter boards to have a mean occupation index higher than non-adopter boards appears to confirm the trend discussed in the previous section. There was, however, no confirmation of tenure as a significant or nearly significant differentiating variable.

These analyses were deemed to present sufficient evidence for the rejection of board null hypothesis 5.1, but to present insufficient evidence for rejection of the remaining board null hypotheses at the .05 level. The hypotheses that "adopter boards differ



TABLE XXI

COMPARISON OF ADOPTER AND NON-ADOPTER  
BOARDS BY CHARACTERISTIC

Variable	Adopters		Non-adopters		t	Probability level
	N	Mean S.D.	N	Mean S.D.		
Number of members	14	11.93 4.91	38	8.95 2.81	2.15 <sup>a</sup>	0.033 <sup>ab</sup>
Mean age of members	4	50.25 4.44	22	49.59 3.92	0.29	0.773
Mean tenure of members	13	6.31 1.81	34	5.74 2.75	0.68	0.500
Mean occ. index	13	64.37 3.57	37	62.52 6.09	1.31 <sup>a</sup>	0.191 <sup>a</sup>
% of members male	14	86.93 11.04	37	84.32 14.73	0.59	0.559
% of members elected	14	71.00 38.34	38	77.97 35.50	0.60	0.549

<sup>a</sup>Corrected by the Welch approximation for lack of homogeneity of variance.

<sup>b</sup>Significant at the .05 level.





significantly from non-adopter boards in mean number of members," and that "adopter boards do not differ significantly from non-adopter boards in mean per cent of members elected, mean per cent of members male, mean age of members, mean tenure of members, and mean occupation index of members," were accepted.

## VI. SUMMARY

Comparisons of ADP adopters and non-adopters on 30 variables revealed significant differences on 6 variables at the .05 level of probability.

Although there were no significant differences between adopter and non-adopter superintendents, the mobility index of adopter business administrators was significantly different from that of non-adopters. The tendency indicated was that non-adopter business administrators were more mobile than adopter business administrators.

The three variables, total enrollment, grade nine enrollment, and total education staff indicated significant differences at the .001 level between adopter and non-adopter districts. There was a clear indication of the tendency for adopter districts to be larger than non-adopter districts.

None of the differences between adopter and non-adopter board members, on three variables, was significant at the .05 level. The difference between adopter and non-adopter boards in terms of number of members was significant at the .05 level, with adopter boards



tending to have more members than non-adopters.

Chi square tests for independence of adoption and district, community and board member dichotomous variables revealed a significant association between adoption and community type at the .05 level of probability. The tendency indicated was for higher proportion of adopter districts to be located in metropolitan than non-metropolitan areas.

One overriding finding appears as the result of the comparison of adopters and non-adopters of ADP reported in this chapter. Each of the six variables which significantly differentiated between adopters and non-adopters appeared to be related to a "size" factor. The three district variables, total enrollment, grade nine enrollment, and total education staff, which clearly represent district size, revealed differences between adopter and non-adopter districts which had probabilities of occurring as a result of chance in less than one case out of 1000. The other variables which indicated significant differences between adopters and non-adopters were all correlated significantly with the size variables. This suggests that the business administrator's mobility, the number of board members, and the community type, although statistically significant in relation to the adoption of ADP, are indirectly related to adoption via the size factor.

Nevertheless, the results of the comparison of adopter and non-adopter districts indicates that those districts which have



adopted ADP tend to be larger, in terms of enrollment and staff complement, than non-adopter districts. They are more likely to be located in a metropolitan area of population greater than 100,000, to have more board members, and to have business administrators who have worked in fewer organizations, than non-adopter districts.

Other tendencies, although not significant at the .05 level, indicate that adopter districts tend to have superintendents who have held positions in fewer districts, and business administrators with more formal education than non-adopter districts. Adopter districts tend to have a smaller per cent of their education staff male, and to be located in communities with a smaller per cent of residents Canadian born, and tend to have trustees with higher occupational status than non-adopter districts.





## REFERENCES FOR CHAPTER V

<sup>1</sup>Richard O. Carlson, Adoption of Educational Innovations (Eugene, Oregon: The Center for the Advanced Study of Educational Administration, The University of Oregon, 1965), pp. 53-56.



## CHAPTER VI

### PREDICTION OF EXTENT OF ADP ADOPTION

One of the major purposes of the present study was to determine which of the research variables were the best predictors of the extent of ADP adoption. For the purposes of this chapter, the adopter sample is defined as those 14 districts which performed one or more business or pupil accounting operations in full or in part on automatic data processing equipment.

The analyses presented in this chapter assume the dependent variable, extent of adoption, to be continuous, with a value equal to the number of operations the district reported were being done on ADP equipment. Although this may be questioned, it was assumed that the number of operations was a reliable representation of the extent of the use of ADP.

#### I. DESCRIPTION OF THE ADOPTER SAMPLE

No detailed description of the adopter sample will be presented here. The characteristics of the adopter sample are indicated in Chapter V in the tables presenting the comparison of adopters and non-adopters (Tables XII to XXI). Suffice it to say that 14 districts with a mean enrollment of over 40,000 pupils reported the use of ADP techniques.





### Extent of ADP Adoption

As yet, this report has not indicated the extent to which the members of the adopter sample had adopted ADP. Table XXII indicates the number of ADP operations performed by districts in the adopter sample. The number of operations performed ranged from 2 to 30 with a mean of 10.79. The distribution is, however, positively skewed. A more meaningful measure of the central tendency, under these conditions, would be the median. The median number of operations performed was 7.0.

### Relationships Between Variables Within the Adopter Sample

As can be seen in Table XLVIII (Appendix E), many of the correlation coefficients of variables within the adopter sample are of similar magnitude to those in the total sample, (Table XLVI, Appendix D). The much smaller number of members of the adopter sample, however, makes fewer of these relationships significant at the .05 level.

A detailed comparison of the relationships existent within the total sample with those in the adopter sample will not be attempted. Rather, a brief summary of the relationships unique to the adopter sample will be presented.

None of the relationships noted among the characteristics of the chief executive officers and other research variables in the total sample was at a significant level in the adopter sample. However, a number of other relationships, significant at the .05 level, appeared.



TABLE XXII

FREQUENCY DISTRIBUTION OF NUMBER  
OF ADP OPERATIONS BY DISTRICTS  
IN THE ADOPTER SAMPLE

Number of Operations	Number of districts
30 or more	1
27-29	1
24-26	
21-23	1
18-20	
15-17	
12-14	1
9-11	2
6-8	3
3-5	3
less than 3	2
Total	14
Mean	10.79
Standard Deviation	9.00
Median	7.00



The superintendent's mobility was positively correlated with his tenure. His amount of education was positively correlated with the per cent of board members elected, and negatively with the per cent of board members male, both at a significant level. His recency of education had a significant, negative correlation with the per cent of residents Canadian born. His mobility correlated significantly with the per cent of district education staff male, in the negative direction, and the number of professional journals he read correlated negatively with both the district religious type and the per cent of board members male, at a significant level.

The business administrator's amount of education had a significant, positive correlation with the per cent of board members elected, and his recency of education had a significant, positive correlation with community type. Significant negative correlations appeared between the district expenditure and the business administrator's tenure, and between the per cent of board members male and the number of professional journals he regularly read.

Within the district variables, expenditure was positively correlated with both per cent of staff male, and mean years training of staff. Per cent of staff male correlated negatively with pupil-staff ratio, and mean years training of staff correlated positively with enrollment type, both at a significant level. There was also a significant positive correlation between mean years training of staff and community type (metropolitan or non-metropolitan).





The per cent of board members male correlated negatively with both the per cent of board members elected and the pupil-staff ratio, at a significant level. The per cent of board members male also correlated negatively and significantly with community type. The mean occupation index of board members was significantly correlated with grade nine enrollment in the positive direction.

Finally, the dependent variable (extent of adoption) correlated positively with the size of the education staff, at the .05 level, and with the number of board members, total enrollment, and grade nine enrollment, at the .01 level. It also correlated, at the .05 level, with per cent of residents Canadian born, in the negative direction.

## II. SELECTION OF PREDICTOR VARIABLES

As indicated in Chapter III, the multiple regression analysis for the prediction of the extent of ADP adoption required that the number of independent variables be 3 less than the sample size. Therefore, it was necessary to select 11 of the 30 research variables for the prediction analysis. The criteria for selection were (1) the variable must have a high correlation with the criterion variable, and (2) it must have few, or insignificant correlations with other independent variables.

Table XXIII illustrates the use of these criteria for the selection of predictor variables. The method involved:

1. Ranking the independent variables according to their



TABLE XXIII

SELECTION OF PREDICTION VARIABLES USING RANKS  
OF CORRELATIONS WITH CRITERION AND NUMBER  
OF SIGNIFICANT CORRELATIONS  
WITH OTHER VARIABLES

Variable	N	Rank corr. with criterion	Number of sig. corr.	Rank of corr.	Sum cols. (3) + (5)	Rank for pred.
(1)	(2)	(3)	(4)	(5)	(6)	(7)
Supt. age	14	20	0	3.5	23.5	8
Supt. amt. ed.	14	13	2	16	29	12
Supt. rec. ed.	12	19	1	10.5	29.5	13.5
Supt. tenure	14	21	1	10.5	31.5	15.5
Supt. mobility	14	23	1	10.5	33.5	22
Supt. prof. j.	13	29	2	16	45	27
Bus. Ad. age	10	24	0	3.5	27.5	10.5
Bus. Ad. amt. ed.	10	7	1	10.5	17.5	4
Bus. Ad. rec. ed.	7	22	1	10.5	32.5	19
Bus. Ad. tenure	10	6	1	10.5	16.5	3
Bus. Ad. mobility	10	28	0	3.5	31.5	15.5
Bus. Ad. prof. j.	10	9	1	10.5	19.5	5
Total enrollment	14	3	5	24.5	27.5	10.5
Gr. 9 enrollment	14	2	4	20.5	22.5	7
Enrollment type	14	15	5	24.5	39.5	25
Expenditure	11	30	6	28	58	30
% staff male	11	27	6	28	55	29
Total staff	12	4	4	20.5	24.5	9
Religious type	14	25	2	16	41	26
Pupil-staff ratio	12	8	5	24.5	32.5	19
Mean train. staff	8	14	3	18	32	17
Mean exp. staff	7	26	0	3.5	29.5	13.5
No. bd. members	14	1	1	10.5	11.5	1
% bd. elected	14	14	7	30	48	28
% bd. male	14	10	5	24.5	34.5	23
Mean age bd.	4	11	0	3.5	14.5	2
Mean occ. ind. bd.	13	12	4	20.5	32.5	19
Mean tenure bd.	13	17	0	3.5	20.5	6
% Canadian born	12	5	6	28	33	21
Community type	14	16	4	20.5	36.5	24





correlation coefficients with the criterion variable, (highest correlation ranked 1).

2. Ranking the independent variables according to the number of significant ( $p \leq .05$ ) correlations with other independent variables, (variable with the fewest correlations ranked 1).

3. Summing the two ranks for each independent variable.

4. Ranking the independent variables according to the sum of the two previous ranks, (lowest sum ranked 1).

This final ranking gave the order of preference for the inclusion of each variable in the prediction analysis. However, as can be seen in Table XXIII, the number of cases for each variable was not 14. For example, the number of cases for the variable which ranked 2 (mean age of board members) was 4. Thus, the choice of predictor variables dictated the size of subsample used in the multiple regression analysis.

Selecting the variables ranked 1 to 11 inclusive reduced the sample to 4 cases. By omitting the mean age of board members as a variable, the number of cases was raised to 9. However, as noted earlier, the number of independent variables must be at least 3 less than the number of cases. Therefore, the variables ranked 1, 3, 4, 5, 6, and 7 were selected for the multiple regression prediction. These variables are, respectively, number of board members, business administrator's tenure, business administrator's amount of education, business administrator's number of professional journals, mean years



tenure of board members, and grade nine enrollment.

### III. PREDICTION OF EXTENT OF ADP USE

Table XXIV presents the results of the multiple regression analysis of six selected independent variables using extent of adoption of ADP as the criterion variable.

The best predictor of the extent of ADP adoption was the number of board members in the district. This variable accounted for 72.91 per cent of the variance of the criterion variable.

The business administrator's amount of education accounted for an additional corrected 7.05 per cent, giving a total of 79.96 per cent of the criterion variable accounted for, or predicted by these two variables. The contributions of the remaining four selected variables was negated by the correction necessary for the inflation of the  $R^2$  due to small sample size. The method used for correcting  $R^2$  was that suggested by Guilford.<sup>1</sup>

### IV. SUMMARY

The purpose of this chapter was to present the results of an analysis of the research variables to determine which were best predictors of the extent of ADP adoption. After a brief examination of the relationships between variables in the adopter sample, six variables were selected using a summed rank technique. The selection was based on the criteria (1) the independent variable should have a high



TABLE XXIV

MULTIPLE REGRESSION PREDICTION OF EXTENT  
OF ADP ADOPTION BY SIX SELECTED  
VARIABLES  
(N = 9)

Order of entry in regression analysis	Variable	Correlation <sup>a</sup> with criterion variable	Per cent of variance accounted for stepwise	Cumulated per cent of variance accounted for	Corrected <sup>b</sup> cumulated per cent of var. accounted for
1	Number of bd. members	0.854	72.91	72.91	72.91
2	Bus. Ad. amt. of ed.	0.496	12.03	84.93	79.96
3	Gr. nine enrollment	0.620	1.55	86.48	78.37
4	Mean tenure of bd. members	0.427	2.33	88.81	77.62
5	Bus. Ad. tenure	-0.507	3.29	92.10	78.99
6	Bus. Ad. prof. journals	0.326	0.76	92.86	71.44

<sup>a</sup>Coefficients are product-moment correlations.

<sup>b</sup>Correction for inflation of  $R^2$  due to small sample size was that suggested by Guilford.





correlation with the dependent variable, and (2) it should have few, or insignificant correlations with other independent variables.

The variables selected were the business administrator's amount of education, tenure, and number of professional journals, the district's grade nine enrollment, the number of board members, and their mean tenure. Using six variables, on a subsample of nine districts, the multiple regression analysis revealed that the number of board members accounted for 72.91 per cent of the variation of the criterion variable. A correction for inflation of  $R^2$ , due to a small sample size, was used to determine the contribution of the remaining variables. The business administrator's amount of education accounted for an additional 7.05 per cent, giving a total of 79.96 per cent of the extent of adoption of ADP accounted for by these two variables. The contribution of the remaining four selected variables was negligible.



## REFERENCES FOR CHAPTER VI

<sup>1</sup>J. P. Guilford, Fundamental Statistics in Psychology and Education (fourth edition; New York: McGraw-Hill Book Company, Inc., 1965), p. 401.





## CHAPTER VII

### SURVEY OF ADP USE

Fourteen districts reported that they were using punch card or computer methods in their central office accounting. Although it was realized that these districts might not include all districts in Canada using ADP, it was assumed that they were a representative sample and that a survey of their automated accounting procedures would be useful.

The purpose of this chapter is to describe the central office accounting operations being performed on punch card or computer equipment, the type and cost of equipment being used, and the apparent trends in the implementation of automatic data processing.

For the purposes of this chapter, adopter districts will be identified by the letters A - N inclusive. Table XXV identifies the adopter districts and the letter used to represent each.

#### I. REASONS FOR NON-ADOPTION.

One of the sections of the questionnaire sent to superintendents requested that the respondent state in one or two sentences the reason why his district had not adopted automatic techniques. Thirty-five of the forty-four non-adopter districts gave reasons for not adopting ADP. Table XXVI presents a summary of the stated reasons.



TABLE XXV  
IDENTIFICATION OF ADOPTER DISTRICTS

Identification letter	Name of district
A	Edmonton Public School Board
B	Calgary Public School Board
C	Winnipeg School Division
D	St. James School Division
E	Bay of Quinte District High School Board
F	Fort William Board of Education
G	Hamilton Board of Education
H	Etobicoke Board of Education
I	Toronto Board of Education
J	North York Board of Education
K	Windsor Board of Education
L	Central York District High School Board
M	Quebec city Commission des Ecoles Catholiques
N	Pointe Claire and Beaconsfield Protestant School Board



TABLE XXVI

SUMMARY OF STATED REASONS  
FOR NOT ADOPTING ADP

Reason	Frequency of response
District not large enough	20
ADP too expensive	10
Traditional accounting procedures satisfactory	8
ADP adoption under investigation	3
Lack of local facilities	2
Lack of space	2
Awaiting district reorganization	2
No given reason	9





Twenty districts stated that they were too small to make adoption of ADP feasible. Ten expressed the belief that adoption of ADP would be too expensive. Satisfaction with traditional procedures was listed by eight districts. These three accounted for over eighty per cent of the responses to the question.

It should be noted that the smallest adopter district had a total of only 3,800 students, and that 19 of the 20 districts which indicated that they were not large enough to adopt ADP had enrollments of greater than 4,000. However, none of these districts had an enrollment greater than the mean enrollment of adopter districts (40,000).

Moreland concluded from his study that automatic data processing could be used to advantage in school districts enrolling less than 6,000 pupils.<sup>1</sup> Sixteen of the 20 districts had enrollments greater than 6,000. These findings suggest that, as Eichholz and Rogers note, ". . . the real reasons for rejection and the stated reasons for rejection were not always the same."<sup>2</sup>

## II. EQUIPMENT

Automatic data processing machines are divided into two general groups: punch-card equipment, which may be referred to as electromechanical machines; and electronic data processing machines, which are often called electronic computers.<sup>3</sup>

Adopter districts reported the use of both punch card and computer equipment for their central office accounting.



Table XXVII shows the punch card equipment being used by seven districts. A total of 41 machines were reported in use, ranging from 2 units in districts A and G to 11 units in district I. Key punches and verifiers are the most numerous of the machines listed, with 11 and 8 reported in service respectively. Summary punches and accounting tabulators are least common, each being reported twice.

Eleven districts report the use of computer facilities. As can be seen in Table XXVIII, three of these districts have a computer in their local office. The other eight districts use the computer facilities of data centers or other organizations with computer installations.

### III. ACCOUNTING OPERATIONS

This study was delimited to central office operations performed on ADP equipment. Operations performed and equipment located within the schools or used for instructional purposes were not included.

The central office accounting operations surveyed in the present study can be considered to fall into two general categories, business accounting and pupil accounting.

#### Business Accounting

Table XXIX displays the business accounting operations performed on ADP equipment in eleven adopter districts. The number of operations performed ranges from 2, by district K, to 17, by district J.





TABLE XXVII  
PUNCH CARD EQUIPMENT USED IN LOCAL  
BOARD OFFICES, BY DISTRICT

Machine	District							Total
	A	C	F	G	I	J	M	
Key Punch	1	1	1	1	3	2	2	11
Verifier	1	1		1	2	2	1	8
Summary Punch						1	1	2
Interpreter		1			1	1	1	4
Collator		1	1		2	1		5
Sorter		1			2	1	1	5
Reproducer		1	1		1		1	4
Accounting Tabulator		1					1	2
Total	2	7	3	2	11	8	8	41



TABLE XXVIII  
 USE OF COMPUTER IN LOCAL OFFICE  
 OR OTHER CENTER, BY DISTRICT

District	Computer location	
	local office	other center
A		x
B		x
E		x
G		x
H		x
I	x	
J	x	
K		x
L		x
M	x	
N		x
Total	3	8



TABLE XXIX

BUSINESS ACCOUNTING OPERATIONS PERFORMED  
ON ADP EQUIPMENT, BY DISTRICT

Operation	District											Total
	A	B	C	E	F	G	H	I	J	K	M	
Cash receipts			x	x	x			x	x			5
Cash payments			x	x	x				x			4
General ledger			x	x	x	x	x	x	x			7
Trial balance			x	x				x	x			4
Expense ledger					x	x		x	x			4
Payroll	x	x	x	x	x		x	x	x	x	x	10
Pension records	x	x		x	x		x	x	x		x	8
T-4 forms	x	x	x	x	x		x	x	x	x	x	10
Federation fees				x				x	x			3
Personnel records		x				x			x		x	4
Cost analysis			x					x				2
Maintenance records								x	x		x	3
Budgeting					x	x			x			3
Accounts payable			x		x	x		x	x			5
Inventory (equip.)						x			x			2
Inventory (supplies)	x		x					x	x			4
Purchasing						x			x			2
Transportation									x			1
Bonds (debentures)			x									1
Textbooks						x						1
Other	x					x	x	x				4
Total	5	4	10	8	9	9	5	13	17	2	5	87





The most common business accounting operations performed on ADP equipment were those related to payroll. Ten of the eleven districts report payroll and tax deduction accounting, and eight report pension record accounting done on ADP equipment. The least common operations reported were transportation, bond or debenture records, and textbook accounting.

### Pupil Accounting

The pupil accounting operations performed in part or completely on ADP equipment, as reported by ten districts, are presented in Table XXX. District G reported that it used ADP equipment for 20 pupil accounting operations, while districts A, D, and M report 2, 2, and 1 operation respectively. Operations most frequently automated include grade reporting, enrollment statistics, test results, and honors lists. The operations permanent records, eligibility reports, personality profiles, teacher and room scheduling, and library records, were those reported least often as performed on ADP equipment.

In general, more business accounting was done by more districts on ADP equipment than was pupil accounting. This does not, however, take into account the possibility that some of the operations listed may have required a great deal more ADP time than did others.

## IV. COSTS

Although per operation on per machine cost comparisons are impossible because of the diversity of methods employed for handling



TABLE XXX

PUPIL ACCOUNTING OPERATIONS PERFORMED  
ON ADP EQUIPMENT, BY DISTRICT

Operation	District										Total
	A	C	D	G	H	I	J	L	M	N	
Enrollment stat.		x		x			x		x	x	5
Attendance				x		x	x	x			4
Grade reporting	x			x	x	x	x	x			6
Grade distribution	x	x		x	x						4
Permanent records				x							1
Test marking		x		x	x		x				4
Test results		x	x	x	x		x				5
Class ranks				x		x					2
Failure lists				x	x	x	x				4
Honors lists				x	x	x	x	x			5
Eligibility reports				x							1
Personality profiles				x							1
Course choice tallies				x			x			x	3
Conflict matrix				x						x	2
Student scheduling				x						x	2
Teacher scheduling				x							1
Room scheduling				x							1
Class lists				x		x	x			x	4
Mailing & addressing				x		x	x				3
Library records						x					1
Other			x	x		x					3
Total	2	4	2	20	6	9	10	3	1	5	62



accounting procedures, the reported purchase or lease costs and the charges for data center services can be presented.

#### Lease and Purchase Costs

Table XXXI presents the rental or purchase costs and type of equipment for six districts. Districts F and M report purchase prices of ADP equipment of \$10,000 and \$55,000 respectively. Districts A, C, I, and J report average monthly rental costs of from \$270 to \$4,200 for punch card and/or computer equipment.

#### Data Center Costs

Five districts reported the costs of accounting services performed for them by data centers. Table XXXII lists the business and pupil accounting operations performed by data centers and the average monthly cost of the center's services.

The number of operations performed at the data center ranged from 2, by district K, to 30, by district G. The service charges ranged from \$120 to \$10,000 per month.

### V. THE FUTURE

One of the major purposes of this study was the comparison of ADP adopter and non-adopter districts. This implies that the adoption of ADP is a dichotomous variable. However, much of the research on the adoption of innovations has considered adoption as a variable continuous through time. Although no analysis of this





TABLE XXXI

ADP EQUIPMENT OWNED OR LEASED WITH  
PURCHASE PRICE OR AVERAGE MONTHLY  
RENTAL, BY DISTRICT

District	Type of equipment		Purchase price	Average Monthly rental
	Owned	Leased		
A		punch card		\$ 270
C		punch card		625
F	punch card		\$10,000	
I		punch card + computer		4,200
J		punch card + computer		2,800
M	punch card + computer		55,000	



TABLE XXXII

AVERAGE MONTHLY CHARGE FOR DATA CENTER SERVICES  
WITH NUMBER OF OPERATIONS PERFORMED,  
BY DISTRICTS

District	Operations			Average monthly charge
	Business Accounting	Pupil Accounting	Total	
B	4	0	4	\$ 400
E	8	0	8	120
G	9	21	30	10,000
K	2	0	2	135
L	0	3	3	800



type was planned for the present study, the respondents were asked if their district had definite plans for the use of ADP in the future, and if so, when. Table XXXIII summarizes the replies to this question.

Of the forty-four non-adopter districts in the sample, forty-two replied to the question of future plans for ADP. Twenty of these districts replied that they were planning to use punch card or computer techniques in their districts, nine within eighteen months of the current study, and seven within thirty months. The remaining twenty-two districts were not planning to automate any of their central office operations.

## VI. SUMMARY

The purpose of this chapter has been to present a descriptive survey of the type and cost of automatic data processing equipment and services used in Canadian school districts and the operations performed using this equipment or these services.

In response to the question, "why are you not using ADP?" the reasons of "district not large enough," and, "ADP too expensive," accounted for over one half of the replies. Of the 44 districts not using ADP at the time of the survey (1966), 20 had definite plans to adopt it in the near future, while 22 districts did not plan to adopt any automated techniques.

Both punch card (unit record) equipment and computers were used in local board offices. The number of units of punch card equipment ranged from 2 to 11 in district offices, with the key punch being





TABLE XXXIII  
SUMMARY OF FUTURE PLANS FOR  
IMPLEMENTATION OF ADP

Future plans	Frequency of response
Plan to use in 1967	9
Plan to use in 1968	7
Plan to use, but uncertain when	4
Do not plan to use	22
No reply given	2



the most commonly used machine. Three districts had computers in their local offices.

The operations performed were divided into pupil and business accounting operations. Eleven districts reported from 2 to 13 business accounting operations performed on ADP equipment, with the most common being operations related to payroll. Ten districts reported from 1 to 20 pupil accounting operations performed on ADP equipment, with operations related to testing and grade reporting being most common.

A brief survey of costs showed the purchase price of equipment ranged up to \$55,000, and the average monthly rental costs ranged up to \$2,800. Where data center services were used, average monthly charge ranged up to \$10,000.



## REFERENCES FOR CHAPTER VII

<sup>1</sup>Andrew Smith Moreland, "A Study of the Application of Machine Data Processing in Selected Small School Districts in the United States" (unpublished doctoral dissertation, Rutgers--The State University, 1964), Dissertation Abstracts, XXV, p. 2829.

<sup>2</sup>Gerhard Eichholz, and Everett M. Rogers, "Resistance to the Adoption of Audio-visual Aids by Elementary School Teachers: Contrasts and Similarities to Agricultural Innovation," in Matthew B. Miles (ed.), Innovation in Education (New York: Bureau of Publications, Teachers' College, Columbia University, 1964), p. 309.

<sup>3</sup>James W. Whitlock, Automatic Data Processing in Education (New York: The Macmillan Company, 1964), p. 10.





## CHAPTER VIII

### SUMMARY, CONCLUSIONS AND SUGGESTIONS FOR FURTHER RESEARCH

The purposes of this study were to survey the use of automatic data processing in large Canadian school districts, and to analyse the characteristics of selected adopter and non-adopter superintendents, business administrators, districts, school boards, school board members, and communities. This chapter presents a summary of the major findings of the study, presents some conclusions and makes suggestions for further research.

#### I. SUMMARY OF THE STUDY

Questionnaires were mailed to a population of 103 districts throughout Canada. The population districts were selected on the basis of enrollment criteria. A sample of 58, or 56.31 per cent of the population, returned questionnaires. This sample consisted of 14 districts that had adopted ADP and 44 that had not.

#### Comparison of Adopters and Non-adopters

Using t and chi square tests, adopter and non-adopter superintendents, business administrators, districts, board members, boards and communities were compared on 30 variables. A probability level of five per cent was accepted as showing significant differences.

None of the six superintendent variables examined revealed



significant differences between adopter and non-adopter superintendents at the .05 level. Comparison of adopter and non-adopter business administrators showed a significant difference on the mobility variable at the .005 level, with adopters tending to be less mobile than non-adopters.

Three district variables revealed significant differences between adopter and non-adopter districts. Differences significant at the .001 level were found on the variables, total enrollment, grade nine enrollment, and total education staff. In each case adopter districts tended to be larger than non-adopters.

None of the differences between adopter and non-adopter board members was significant. The difference between the number of board members of adopter and non-adopter boards, however, was significant at the .05 level. The tendency shown was for adopter boards to have more members than non-adopters.

The chi square tests revealed significant association between adoption of ADP and community type, at the .05 level. No significant associations were found between adoption and enrollment type, religious type, or board member sex or selection.

#### Prediction of Extent of Adoption

Using a combined rank technique, based on the criteria that a selected variable should be highly correlated with the criterion variable and significantly correlated with few other independent variables, six variables were selected as predictor variables for





the extent of adoption of ADP.

The multiple regression prediction on the subsample of nine districts revealed the number of board members as the best predictor of extent of ADP adoption. It accounted for 72.91 per cent of the variance of the criterion variable. The amount of education of the business administrator accounted for an additional 7.05 per cent. Together, these two variables accounted for 79.96 per cent of the variance in extent of adoption.

## II. CONCLUSIONS

Thirty-five research hypotheses were stated for this study. Twenty-seven of these were developed from the traditions of research on the adoption and diffusion of innovations. The results of the present study supported only four of these hypotheses, and refuted a fifth.

### Discussion

It would seem appropriate to suggest several reasons for the general lack of support for the hypotheses which prompted this study.

Research outside the field of education. A number of the hypotheses were drawn from research in the areas of agriculture, medicine, and industry. It may well be that the unique aspects of educational organizations, discussed in Chapter II, are such that the generalizations made from these other fields of study are not applicable to education.





Canada as a social system. Another suggested reason for the present study not confirming research cited in support of the hypotheses may be that much of the reviewed research dealt with the adoption or diffusion of innovations within relatively small social systems. The present study was based upon the assumption that Canada was a social system. However, the great difference among the provinces of Canada in terms of, among other things, their ability to provide educational services,\* suggests that the generalizations taken from studies of smaller social systems were not appropriate for research of the scope attempted in the present study. That is, the differences among areas of Canada are greater than the differences between adopters and non-adopters of ADP. This situation would tend to confound the findings of this study.

The diffusion process. Much of the research cited compared innovators and/or early adopters with laggards in the social system. Gross compared acceptors and non-acceptors of new farm practices. Although he found that age, education, size of farm, and number of research bulletins read were significant differentiators of acceptors and non-acceptors, he also found a number of variables which did not reveal significant differences. One similarity of the Gross study and the present study is the division of the sample into only two

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\*These differences are clearly demonstrated by J. E. Cheal, Investment in Canadian Youth (Toronto: The Macmillan Company, 1963).



categories. The suggestion is that, if the adoption of an innovation is normally distributed over time, the division of the sample into two categories results in subsamples which are not sufficiently diverse to reveal significant differences. Figure 2 illustrates the categorization of the sample for the current study into adopters and non-adopters. Comparison of this categorization with that suggested by Rogers (Figure 1, p. 16) clearly illustrates how comparisons of innovators and laggards might reveal significant differences which would not be evident in the dichotomous categorization of the present study.

The adoption process. One comment should also be made with regard to the adoption process. The definition of categories for the present study placed districts at the trial and adoption stages of the process in the adopter category, and districts at the awareness, interest, and evaluation stages in the non-adopter category. It seems reasonable to expect that districts at different stages in the adoption process would exhibit different characteristics, characteristics which might not be apparent in the present study. The small number of adopter districts and the nature of the data available on them were deemed to make comparisons, of the type suggested by the descriptions of the adoption and diffusion processes, inappropriate for this study.

A single innovation. Finally, the innovativeness of districts was measured in the present study by the adoption of a single innovation--





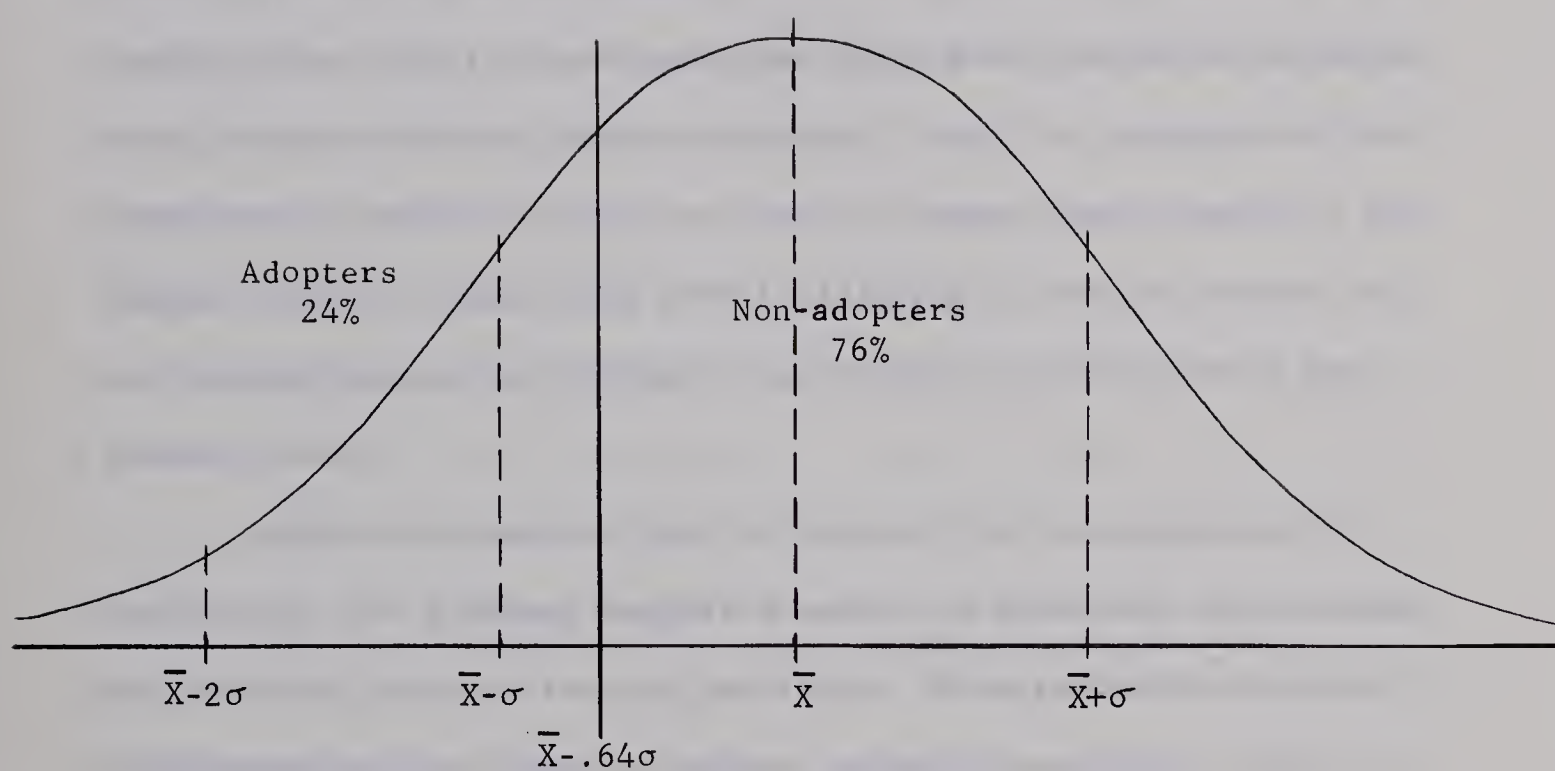


FIGURE 2

CATEGORIZATION OF THE SAMPLE  
ON THE BASIS OF ADOPTION  
OR NON-ADOPTION OF ADP





automatic data processing. The requirements placed upon a district for the adoption of this one innovation, in terms of adequate personnel, financial and equipment resources, might well reduce, to an insignificant level, characteristics which would otherwise differentiate between adopters and non-adopters. That is, a measure of innovativeness which did not place such stringent requirements on the adopter district might well reveal differences between adopter and non-adopter districts or district personnel not uncovered by the present study.

Despite the general lack of support for the hypotheses of this study, the findings suggest a number of important implications. As indicated earlier, the one overriding characteristic which differentiated adopter from non-adopter districts was size. This was manifest in total enrollment, grade nine enrollment, total education staff, number of board members, and community type (metropolitan or non-metropolitan). The indication was that large districts were much more likely to adopt ADP than small districts.

### Implications

If one accepts the assumption that the effectiveness and efficiency of the district's operations are increased by utilization of automated techniques, several implications for the implementation of ADP emerge.

Inter-district cooperation. The fact that small districts in general have not adopted ADP, and that they feel the main reason



for not adopting is that they are too small, suggests that small districts should take steps toward combining their resources and coordinating their efforts with other districts to make administrative units which are of sufficient size in terms of enrollment and resources to make the adoption of ADP feasible. This means that smaller districts must seek the cooperation of other small, or large metropolitan districts for data processing operations.

Provincial coordination. The standardization of practices and procedures which would be necessary for the efficient utilization of punch card or computer equipment by a number of districts, would necessitate the formation of a body whose function would be to coordinate, for ADP operations, the procedures of the participating districts. This intermediate administrative unit would have to be formed under the aegis of the provincial department of education for each province. The suggestion here is that there is a need for the provincial departments of education to provide leadership in the rational implementation of automated techniques.

### III. SUGGESTIONS FOR FURTHER RESEARCH

The exploratory nature of this research suggests two areas which need further study. These are the areas of (1) automatic data processing, and (2) innovation or change in education.

#### Automatic Data Processing

Although quite a number of Canadian school districts have





adopted ADP techniques, there has been little or no research which has examined empirically the advantages or disadvantages of automated over traditional techniques.

Costs. There is a need for research which compares the cost of single or groups of related business or pupil accounting operations done manually with those done on ADP equipment. There appears to be a general opinion among educators that ADP can be of financial advantage only in large districts. There is little research evidence to support or refute this contention.

Applications. There is a similar lack of research on the applications of ADP to educational problems. For example, the design of school bus routes is a problem which many districts must solve. It is quite reasonable to expect that a solution to this kind of problem could be effected much more efficiently using computer techniques than manual methods. Although there has been a great deal of work done, there is still a need for a more general computer program for the production of school schedules. In short, there is a need to examine the multifarious problems encountered in educational organizations, at both the administrative and technical levels, for the possibility of computer solutions.

Morale. One would also expect that the adoption of practices, which pervade as many aspects of the operations of an organization as does ADP, would affect the "climate" of the organization, and the "satisfactions" the individuals in the organization receive from





working within it. That is, to what extent does the adoption of ADP permit or deny the achievement of personal satisfactions of the individuals in the adopting organization? What is suggested here is that research on automatic data processing must be concerned with the achievement of both organizational and personal goals.

#### Educational Change

This study also suggests another area of needed research--educational change.

Comparative studies. Among the suggested reasons that the findings of this study were inconsistent with the traditions of research reviewed was that generalizations made from research in other fields of study and other countries was not applicable to Canadian education. This suggests the need for comparison of educational organizations with other organizations, comparison of Canadian educational organizations with those of other countries such as the United States, the United Kingdom, and Australia, comparison of educational organizations from different areas of Canada. Research of this nature would provide a framework upon which to base further studies of educational change.

Influencers of the adoption process. The current research also suggests the need for further examination of the individuals in a social matrix as influencers of the decision to adopt an innovation. Although this study did not reveal that they were primary influencers of the adoption process, it demonstrated that the chief



business executive and the members of the school board, as well as the superintendent, were of sufficient significance to be legitimate targets for further research into the adoption of innovations.

The indications by some of the smaller districts, that ADP facilities were not available locally, suggest that commercial organizations which produce and market ADP equipment have not, as yet, established branches in some of the smaller communities. This implies the need for examination of the role of the commercial change agent in the process of adoption of innovations in education. Although, as indicated in Chapter II, many believe the lack of an educational change agent, equivalent to the county extension agent in agriculture, is a barrier to educational change, it seems reasonable to expect that a commercial change agent could well promote and facilitate the adoption of innovations in education. Therefore, research directed toward determining what change agents influence the adoption of innovations, and how they influence it would be of great value.

To conclude, there is a need for examination of the complete community power structure. Members of both the formal and informal organizations within the community may well be significant influencers of the decisions to adopt innovations.

There is justification for the statement that both automatic data processing in education and innovation in education, are, at best, imperfectly understood. However, "given an increase in understanding, it seems likely that we may be able to manage educational innovation somewhat more skillfully than we have in the past."<sup>1</sup>





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<sup>1</sup>Matthew B. Miles, "Educational Innovation: The Nature of the Problem," in Matthew B. Miles (ed.). Innovation in Education (New York: Bureau of Publications, Teachers' College, Columbia University, 1964), p. 2.





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## APPENDIX A

### INTRODUCTORY LETTER AND QUESTIONNAIRE (ENGLISH)



Department of Educational Administration  
University of Alberta  
Edmonton, Alberta  
April 4, 1966

Dear Sir:

The use of punch card, computer or automatic data processing (ADP) techniques has become a most valuable tool in the educational systems of Canada. As part of a research project in Educational Administration at the University of Alberta I am surveying the use of ADP and examining some of the characteristics of districts which have adopted it. It is this project for which I require your assistance.

Enclosed are a number of questionnaires. Would you please complete one of the "personal information questionnaires" yourself and have the chief business executive (business administrator, secretary-treasurer, controller, etc.) complete the other one. And would you please have the remaining questionnaires completed by some one with ready access to the necessary information. When they have been completed I would appreciate it if you would gather them together and return them to me in the envelope provided. Please feel free to make supplementary comments if you wish. Each individual's anonymity has been ensured although you will notice a district code number is included so that district identification will be possible.

It is my hope that the information gathered from these returns will provide others involved in Canadian education with knowledge that will enable them to make more efficient and effective use of automatic data processing techniques.

Thank you for your cooperation and contributions.

Yours very truly,

H. D. Hemphill



District  
Code No. \_\_\_\_\_

I. Personal Information -- Superintendent

1. Age: \_\_\_\_\_ 2. Sex: M \_\_\_\_\_ F \_\_\_\_\_

3. You were appointed by:

Provincial Department of Education? \_\_\_\_\_  
Local School Board? \_\_\_\_\_

4. How many years of post-high school education have you had?  
(8 months is equivalent to one academic year) \_\_\_\_\_ years

5. When were you last a full-time student? (including six-week  
summer session courses) \_\_\_\_\_

6. Your most recent courses were in what field of study? \_\_\_\_\_

7. How many years have you been in your present position? \_\_\_\_\_ years

8. Previous positions held:

	POSITION	EMPLOYER	PLACE	YEARS
Most Recent	_____			
Previous to that	_____			
Previous to that	_____			

9. Professional journals regularly read: (Please specify)

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_





District  
Code No. \_\_\_\_\_

II. Personal Information -- Sr. Business Administrator

1. Age: \_\_\_\_\_ 2. Sex: M \_\_\_\_\_ F \_\_\_\_\_

3. You were appointed by:

Provincial Department of Education? \_\_\_\_\_  
Local School Board? \_\_\_\_\_

4. How many years of post-high school education have you had?  
(8 months is equivalent to one academic year) \_\_\_\_\_ years

5. When were you last a full-time student? (including six-week  
summer session courses) \_\_\_\_\_

6. Your most recent courses were in what field of study? \_\_\_\_\_

7. How many years have you been in your present position? \_\_\_\_\_ years

8. Previous positions held:

	POSITION	EMPLOYER	PLACE	YEARS
Most Recent	_____			
Previous to that	_____			
Previous to that	_____			

9. Professional journals regularly read: (Please specify)

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_



District

Code No. \_\_\_\_\_

III. Automatic Data Processing Information

1. Is your district presently employing punch card or computer data processing (ADP) techniques for central office accounting? Yes \_\_\_\_\_  
No \_\_\_\_\_

2. If not, have you definite plans to employ them in the future? Yes \_\_\_\_\_  
No \_\_\_\_\_

If "yes", when? \_\_\_\_\_

3. If your district is not now using ADP would you please explain in one or two sentences why.

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4. If your central office is using ADP equipment, would you please indicate in the appropriate column the number of machines used.

MACHINE	OWNED	RENT FULL TIME	RENT TIME AS NEEDED
Key Punch			
Verifier			
Summary Punch			
Interpreter			
Collator			
Sorter			
Test Scorer			
Accounting Tabulator			
Calculating Punch			
Reproducer			
Computer			
Other (Please specify)			



District

Code No. \_\_\_\_\_

5. If you contract your work out to a data center or another organization, what kind of ADP Installation is used? (computer make and series number, unit record equipment, etc.)

6. Please indicate with a check ( ) which of the following operations your central office performs in part or completely on ADP equipment.

## BUSINESS ACCOUNTING USES

## PUPIL ACCOUNTING USES

Cash Receipts	_____	Enrollment Statistics	_____
Cash Payments	_____	Attendance	_____
General Ledger	_____	Grade Reporting	_____
Trial Balance	_____	Grade Distribution	_____
Expense Ledger	_____	Permanent Records	_____
Payroll	_____	(Academic)	_____
Superannuation or	_____	Test Marking	_____
Pension Records	_____	Test Results	_____
Employee T-4 Forms	_____	Class Ranks	_____
Federation Fee Records	_____	Failure Lists	_____
Personnel Records	_____	Honors Lists	_____
Cost Analysis	_____	Eligibility Reports	_____
Maintenance Records	_____	Personality Profiles	_____
Budgeting	_____	(Guidance)	_____
Accounts Payable	_____	Course Choice Tallies	_____
Inventory (Equipment)	_____	Conflict Matrix	_____
Inventory (Supplies)	_____	Student Scheduling	_____
Purchasing	_____	Teacher Scheduling	_____
Transportation	_____	Room Scheduling	_____
Bond (debenture)	_____	Class Lists	_____
Records	_____	Mailing and Addressing	_____
Textbook Records	_____	Library Records	_____
Others (Please specify)	_____	Others (Please specify)	_____
_____	_____	_____	_____
_____	_____	_____	_____

7. What was your average monthly rental for ADP equipment in the most recent fiscal year?

\$ \_\_\_\_\_

8. What was the total cost of the central office ADP equipment which your district owns?

\$ \_\_\_\_\_





District

Code No. \_\_\_\_\_

IV. District Information

## 1. Pupil enrollment (by grade)

K	_____	6	_____	12	_____
1	_____	7	_____	13	_____
2	_____	8	_____		
3	_____	9	_____		
4	_____	10	_____		
5	_____	11	_____	TOTAL	_____

## 2. Total operating expenditure per pupil in most recently completed fiscal year?

\$ \_\_\_\_\_

3. Total district educational staff:  
(including central office)

Female \_\_\_\_\_

Male \_\_\_\_\_

## 4. Mean years training beyond high school of educational staff.

\_\_\_\_\_ years

## 5. Mean years experience of educational staff.

\_\_\_\_\_ years

V. Board of Trustees Information

Please indicate the characteristics of each member of the board as required.

MEMBER	SELECTION		NUMBER OF YEARS ON THE BOARD	AGE	PRESENT OR MOST RECENT OCCUPATION (be specific)	SEX	
	Elctd.	Apptd.				M	F
A							
B							
C							
D							
E							
F							
G							
H							
I							
J							



## APPENDIX B

### INTRODUCTORY LETTER AND QUESTIONNAIRE (FRENCH)



Department of Educational Administration  
University of Alberta  
Edmonton, Alberta  
April 6, 1966

Cher Monsieur,

L'emploi de cartes poinçonnées calculatrices I.B.M. ou autres techniques de traitements des données (automatic data processing: ADP) a fait connaître des instruments très précieux dans les systèmes d'éducation au Canada. Dans un projet de recherche en administration scolaire à l'université d'Alberta j'étudie l'usage de ces techniques (ADP) et examine quelques caractéristiques des districts qui les ont adoptées. C'est ce projet pour lequel je demande votre collaboration.

Vous trouverez, ci-inclus, quelques questionnaires, Voudriez-vous s'il-vous-plaît, compléter le premier questionnaire sur "information personnelle" et demander au responsable de l'exécutif (administrateur de l'entreprise, secrétaire-trésorier, contrôleur, etc.) de compléter le deuxième. Enfin serait-il possible que la personne qui a accès aux informations nécessaires complète les trois derniers questionnaires. Lorsqu'ils auront été dûment remplis je vous serais reconnaissant si vous recueilliez ces cinq questionnaires et si vous me les retourniez dans l'enveloppe procurée à cette fin. Soyez bien libres de faire des commentaires si vous le désirez. L'annonymat de chaque personne a été assuré quoique vous trouverez un numéro de code pour chaque district afin que l'identification puisse être possible.

C'est à espérer que les informations recueillies par les réponses à ces questionnaires donneront une meilleure connaissance à ceux impliqués dans l'éducation canadienne et les mettra à même de faire un usage plus efficace des techniques modernes.

En vous remerciant de votre coopération et de votre appui, je me dis,

Votre très reconnaissant,

H. D. Hemphill





District

Code No. \_\_\_\_\_

I. Information Personnelle: Directeur des Etudes

1. Age: \_\_\_\_\_ 2. Sexe: H. \_\_\_\_\_ F. \_\_\_\_\_

3. Vous avez été nommé par:

Département d'éducation? \_\_\_\_\_

Commission Scolaire? \_\_\_\_\_

4. Durant combien d'années avez-vous poursuivi des études après l'école secondaire? (8 mois est l'équivalent d'une année académique)

\_\_\_\_\_ années

5. Quand avez-vous été un étudiant à plein temps? (y compris les cours de six semaines durant une session d'été.)

6. Vos cours les plus récents étaient pour quel genre d'étude?

7. Depuis combien d'années détenez votre présente position?

\_\_\_\_\_ années

8. Positions occupées précédemment:

	POSITION	EMPLOYEUR	ENDROIT	ANNEES
Le plus récente	_____	_____	_____	_____
Avant-dernière	_____	_____	_____	_____
Précédente à celle-là	_____	_____	_____	_____

9. Quels sont les revues professionnelles lues régulièrement? (spécifier)

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District

Code No. \_\_\_\_\_

II. Information Personnelle: Administrateur de l'entreprise

1. Age: \_\_\_\_\_ 2. Sexe: H. \_\_\_\_\_ F. \_\_\_\_\_

3. Vous avez été nommé par:

Département d'éducation? \_\_\_\_\_

Commission Scolaire? \_\_\_\_\_

4. Durant combien d'années avez-vous poursuivi des études après l'école secondaire? (8 mois est l'équivalent d'une année académique)

\_\_\_\_\_ années

5. Quand avez-vous été un étudiant à plein temps? (y compris les cours de six semaines durant une session d'été.)

\_\_\_\_\_

6. Vos cours les plus récents étaient pour quel genre d'étude?

\_\_\_\_\_

7. Depuis combien d'années détenez votre présente position?

\_\_\_\_\_ années

8. Positions occupées précédemment:

	POSITION	EMPLOYEUR	ENDROIT	ANNEES
Les plus récente	_____	_____	_____	_____
Avant-dernière	_____	_____	_____	_____
Précédente à celle-là	_____	_____	_____	_____

9. Quels sont les revues professionnelles lues régulièrement? (spécifier)

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_



District

Code No. \_\_\_\_\_

III. Information sur ADP (Automatic Data Processing)

1. Votre district emploie-t-il présentement les techniques des calculatrices I.B.M. ou de cartes poinçonnées, (ADP) techniques à son bureau central? Oui \_\_\_\_\_ Non \_\_\_\_\_
2. Si non, avez-vous des plans assez bien définis pour les utiliser dans l'avenir? Oui \_\_\_\_\_ Non \_\_\_\_\_

Si oui, quand? \_\_\_\_\_

3. Si votre district n'emploie pas maintenant les techniques ADP expliquez pourquoi, par une ou deux phrases.
- \_\_\_\_\_
- \_\_\_\_\_
- \_\_\_\_\_
- \_\_\_\_\_

4. Si votre bureau emploie l'équipement ADP, voulez-vous indiquer dans la colonne appropriée le nombre d'instruments utilisés. Vous excuserez la terminologie anglaise car je n'ai pu trouver l'équivalent français faute d'un bon dictionnaire technique que je n'ai pas en ma possession malheureusement.

INSTRUMENT	POSSEDE	LOUE PLEIN TEMPS	LOUE AU BESOIN
Key Punch			
Verifier			
Summary Punch			
Interpreter			
Collator			
Sorter			
Test Scorer			
Accounting Tabulator			
Calculating Punch			
Reproducer			
Computer			
Other (Please specify)			





District  
Code No. \_\_\_\_\_

5. Si vous faites faire le travail au dehors centre ADP ou autre organisation quel genre l'installation ADP y a-t-il?

6. Indiquez par un crochet laquelle des opérations suivantes votre bureau effectue en tout ou en partie par l'équipement ADP.

BUSINESS ACCOUNTING USES		RAPPORTS POUR LES ELEVES	
Cash Receipts	_____	Statistiques d'enrôlement	_____
Cash Payments	_____	Assiduité	_____
General Ledger	_____	Bulletin personnel	_____
Trial Balance	_____	Bulletin général de l'école	_____
Expense Ledger	_____	Registre Permanents	_____
Payroll	_____	Correction l'examen	_____
Superannuation or	_____	Resultat d'examen	_____
Pension Records	_____	Rangs de classe	_____
Employee T-4 Forms	_____	Liste des insuccès	_____
Federation Fee Records	_____	Liste des méritants	_____
Personnel Records	_____	Rapport d'éligibilité	_____
Cost Analysis	_____	Profile de personnalité	_____
Maintenance Records	_____	(orientation)	_____
Budgeting	_____	Choix de cours par l'élève	_____
Accounts Payable	_____	Matrice d'horaire	_____
Inventory (Equipment)	_____	Horaire d'étudiant	_____
Inventory (Supplies)	_____	Horaire de professeur	_____
Purchasing	_____	Horaire de classe	_____
Transportation	_____	Liste de classe	_____
Bond (debenture)	_____	Correspondance	_____
Records	_____	Registre de bibliothèque	_____
Textbook Records	_____		_____
Others (Please specify)	_____	Autres	_____
_____	_____	_____	_____
_____	_____	_____	_____

7. Quelle fut la moyenne de location par mois pour l'équipement ADP, dans la plus récente année fiscale?

\$ \_\_\_\_\_

8. Quel fut le coût total de l'équipement ADP à votre bureau central qui appartient à votre district?

\$ \_\_\_\_\_



District

Code No. \_\_\_\_\_

IV. Information sur le district

## 1. Enrôlement d'élèves (par degré)

K	_____	6	_____	12	_____
1	_____	7	_____	13	_____
2	_____	8	_____		
3	_____	9	_____		
4	_____	10	_____		
5	_____	11	_____	TOTAL	_____

## 2. Dépense totale d'opération par élève dans la plus récente année fiscale?

\$ \_\_\_\_\_

## 3. Nombre total des personnes chargées du travail en éducation (inclure celles du bureau central)

H \_\_\_\_\_

F \_\_\_\_\_

## 4. Moyenne des années de formation après l'école secondaire de ces personnes.

\_\_\_\_\_ années

## 5. Moyenne des années d'expérience de ces personnes.

\_\_\_\_\_ années

V. Information sur les commissaires

Indiquez, s'il-vous-plaît, les caractéristiques de chaque membre de la commission scolaire comme demandées.

MEMBRE	SELECTION		NOMBRE D'ANNEES A LA COMMISSION	AGE	OCCUPATION (présente, ou la plus récente) (être spécifique)	SEXE	
	Elu	Nomme				H	F
A							
B							
C							
D							
E							
F							
G							
H							
I							
J							



## APPENDIX C

### RETURN GROUP COMPARISONS





TABLE XXXIV  
COMPARISON OF RETURN GROUPS ONE AND TWO  
BY SUPERINTENDENT CHARACTERISTIC

Variable	Group 1		Group 2		t	Probability level
	N	Mean	N	Mean		
Age	34	54.68	17	51.94	1.33	0.191
Amount of education	34	6.26	17	6.00	0.64	0.524
Recency of education	33	14.94	15	11.93	1.19	0.239
Tenure	33	8.39	17	5.82	1.42	0.163
Mobility	33	2.52	17	2.47	0.13	0.901
Professional journals	33	4.94	16	5.19	0.36	0.723



TABLE XXXV

COMPARISON OF RETURN GROUPS ONE AND THREE  
BY SUPERINTENDENT CHARACTERISTIC

Variable	Group 1		Group 3		t	Probability level
	N	Mean S.D.	N	Mean S.D.		
Age	34	54.68 7.34	5	55.40 3.72	0.21	0.834
Amount of education	34	6.26 1.42	5	7.00 0.89	1.10	0.280
Recency of education	33	14.94 8.63	5	18.20 9.26	0.76	0.453
Tenure	33	8.39 6.48	5	4.80 0.98	2.97 <sup>a</sup>	0.003 <sup>ab</sup>
Mobility	33	2.52 1.18	5	2.20 1.47	0.52	0.605
Professional journals	33	4.94 2.32	5	5.60 2.50	0.57	0.571

<sup>a</sup>Corrected by the Welch approximation for lack of homogeneity of variance.<sup>b</sup>Significant at the .005 level.



TABLE XXXVI

COMPARISON OF RETURN GROUPS TWO AND THREE  
BY SUPERINTENDENT CHARACTERISTIC

Variable	Group 2		Group 3		t	Probability level
	N	Mean S.D.	N	Mean S.D.		
Age	17	51.94 5.62	5	55.40 3.72	1.24	0.231
Amount of education	17	6.00 1.24	5	7.00 0.89	1.61	0.124
Recency of education	15	11.93 6.06	5	18.20 9.26	1.65	0.117
Tenure	17	5.82 4.78	5	4.80 0.98	0.83 <sup>a</sup>	0.410 <sup>a</sup>
Mobility	17	2.47 1.14	5	2.20 1.47	0.41	0.683
Professional journals	16	5.19 2.04	5	5.60 2.50	0.36	0.726

<sup>a</sup>Corrected by the Welch approximation for lack of homogeneity of variance.





TABLE XXXVII

COMPARISON OF RETURN GROUPS ONE AND TWO BY  
BUSINESS ADMINISTRATOR CHARACTERISTIC

Variable	Group 1		Group 2		t	Probability level
	N	Mean S.D.	N	Mean S.D.		
Age	28	47.68 8.49	17	47.59 7.47	0.04	0.972
Amount of education	28	3.32 1.95	16	2.50 1.94	1.32	0.195
Recency of education	17	20.18 13.72	13	21.23 9.32	0.23	0.820
Tenure	27	8.96 7.34	17	10.24 5.50	0.60	0.552
Mobility	27	2.63 1.02	15	2.33 1.14	0.84	0.404
Professional journals	27	3.63 2.71	16	3.81 2.01	0.23	0.820



TABLE XXXVIII

COMPARISON OF RETURN GROUPS ONE AND THREE BY  
BUSINESS ADMINISTRATOR CHARACTERISTIC

Variable	Group 1		Group 3		t	Probability level
	N	Mean S.D.	N	Mean S.D.		
Age	28	47.68 8.49	4	48.50 6.22	0.18	0.858
Amount of education	28	3.32 1.95	4	4.00 2.00	0.63	0.534
Recency of education	17	20.18 13.72	4	19.00 9.30	0.16	0.878
Tenure	27	8.96 7.34	4	4.75 1.92	2.47 <sup>a</sup>	0.015 <sup>ab</sup>
Mobility	27	2.63 1.02	4	1.75 0.43	1.64	0.112
Professional journals	27	3.63 2.71	4	4.00 2.74	0.25	0.807

<sup>a</sup>Corrected by the Welch approximation for lack of homogeneity of variance.

<sup>b</sup>Significant at the .05 level.



TABLE XXXIX

COMPARISON OF RETURN GROUPS TWO AND THREE BY  
BUSINESS ADMINISTRATOR CHARACTERISTIC

Variable	Group 2		Group 3		t	Probability level
	N	Mean	N	Mean	S.D.	
Age	17	47.59	4	48.50	6.22	0.832
Amount of education	16	2.50	4	4.00	2.00	0.208
Recency of education	13	21.23	4	19.00	9.30	0.700
Tenure	17	10.24	4	4.75	1.92	0.077
Mobility	15	2.33	4	1.75	0.43	0.354
Professional journals	16	3.81	4	4.00	2.74	0.885





TABLE XL

COMPARISON OF RETURN GROUPS ONE AND TWO BY  
DISTRICT AND COMMUNITY CHARACTERISTIC

Variable	Group 1		Group 2		t	Probability level		
	N	Mean	S.D.	N			Mean	S.D.
Total enrollment	33	14,949.67	15,379.40	18	22,778.00	28,702.33	1.08 <sup>a</sup>	0.283 <sup>a</sup>
Grade nine enrollment	32	1,506.97	1,308.66	17	2,302.47	2,202.74	1.37 <sup>a</sup>	0.173 <sup>a</sup>
Expenditure (\$)	24	496.79	154.68	10	504.30	107.44	0.14	0.893
Total education staff	30	622.60	652.04	14	1,113.86	1,326.01	1.31 <sup>a</sup>	0.190 <sup>a</sup>
Pupil-staff ratio	28	22.51	3.31	14	21.48	2.64	0.99	0.327
% staff male	20	46.20	13.76	12	46.33	11.88	0.03	0.979
Mean experience of staff	16	7.82	2.35	8	8.45	2.57	0.58	0.569
Mean training of staff	18	3.33	0.68	7	3.24	0.62	0.30	0.771
% residents Canadian born	28	80.00	7.40	15	77.47	9.37	0.95	0.348

<sup>a</sup>Corrected by the Welch approximation for lack of homogeneity of variance.



TABLE XLI

COMPARISON OF RETURN GROUPS ONE AND THREE BY  
DISTRICT AND COMMUNITY CHARACTERISTIC

Variable	Group 1			Group 3			t	Probability level
	N	Mean	S.D.	N	Mean	S.D.		
Total enrollment	33	14,949.67	15,379.40	5	18,664.00	13,745.58	0.50	0.622
Grade nine enrollment	32	1,506.97	1,308.66	5	1,541.60	1,115.93	0.17	0.866
Expenditure (\$)	24	496.79	154.68	4	369.25	101.91	1.54	0.137
Total education staff	30	622.60	652.04	5	805.60	606.67	0.57	0.573
Pupil-staff ratio	28	22.51	3.31	5	23.48	1.70	0.62	0.540
% staff male	20	46.20	13.76	5	42.00	15.02	0.57	0.571
Mean experience of staff	16	7.82	2.35	3	8.63	3.60	0.48	0.640
Mean training of staff	18	3.33	0.68	2	4.20	0.10	1.71	0.104
% residents Canadian born	28	80.00	7.40	4	85.25	8.38	1.26	0.216



TABLE XLII

COMPARISON OF RETURN GROUPS TWO AND THREE BY  
DISTRICT AND COMMUNITY CHARACTERISTIC

Variable	Group 2			Group 3			t	Probability level
	N	Mean	S.D.	N	Mean	S.D.		
Total enrollment	18	22,778.00	28,702.33	5	18,664.00	13,745.58	0.30	0.769
Grade nine enrollment	17	2,302.47	2,202.74	5	1,541.60	1,115.93	0.71	0.486
Expenditure (\$)	10	504.30	107.44	4	369.25	101.91	2.00	0.069
Total education staff	14	1,113.86	1,326.01	5	805.60	606.67	0.47	0.641
Pupil-staff ratio	14	21.48	2.64	5	23.48	1.70	1.50	0.152
% staff male	12	46.33	11.88	5	42.00	15.02	0.59	0.562
Mean experience of staff	8	8.45	2.57	3	8.63	3.60	0.09	0.934
Mean training of staff	7	3.24	0.62	2	4.20	0.10	1.93	0.095
% residents Canadian born	15	77.47	9.37	4	85.25	8.38	1.43	0.172





TABLE XLIII  
CHI SQUARE TEST FOR INDEPENDENCE  
OF ENROLLMENT TYPE AND  
RETURN GROUP

Enrollment type	Return group			Total
	1	2	3	
Unified	23	12	4	39
Secondary	8	5	1	14
Total	31	17	5	53
Chi square = 0.190 (not significant)				



TABLE XLIV  
CHI SQUARE TEST FOR INDEPENDENCE  
OF RELIGIOUS TYPE AND  
RETURN GROUP

Religious type	Return group			Total
	1	2	3	
Public	29	16	5	50
Denominational	1	2	0	8
Total	30	18	5	58
Chi square = 1.600 (not significant)				



TABLE XLV  
 CHI SQUARE TEST FOR INDEPENDENCE  
 OF COMMUNITY TYPE AND  
 RETURN GROUP

Community type	Return group			Total
	1	2	3	
Metropolitan	18	9	4	31
Non-metropolitan	17	9	1	27
Total	35	18	5	58
Chi square = 1.564 (not significant)				





APPENDIX D

INTERCORRELATION OF THIRTY VARIABLES  
WITHIN THE SAMPLE



TABLE XLVI

INTERCORRELATION<sup>a</sup> OF THIRTY VARIABLES  
WITHIN THE SAMPLE

Variable	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15 <sup>b</sup>	Variable
1. Supt. age	1.000	-0.031	0.487 <sup>c</sup>	0.416 <sup>c</sup>	-0.279 <sup>d</sup>	0.069	0.002	0.163	0.171	-0.022	0.105	0.219	0.211	0.106	-0.420 <sup>c</sup>	1
2. Supt. amt. ed.		1.000	.035	.093	.133	.128	.143	.057	-.069	.216	-.174	.089	.165	.187	.022	2
3. Supt. rec. ed.			1.000	.367 <sup>c</sup>	.019	.215	-.065	.220	.367 <sup>d</sup>	-.099	-.154	.298	.228	.185	-.145 <sup>d</sup>	3
4. Supt. tenure				1.000	.093	.226	.159	-.147	.357 <sup>d</sup>	.196	.097	.117	-.063	-.188	-.290 <sup>d</sup>	4
5. Supt. mobility					1.000	.122	.057	-.132	-.189	.267	.243	.210	-.145	-.193	-.108	5
6. Supt. prof. j.						1.000	.256	-.066	.345 <sup>c</sup>	.130	-.010	.296	.045	-.042	-.202	6
7. Bus. Ad. age							1.000	-.070	.524 <sup>c</sup>	.673 <sup>c</sup>	-.117	-.036 <sup>d</sup>	-.061	-.154	-.214	7
8. Bus. Ad. amt. ed.								1.000	-.195	-.084	.083	.369 <sup>d</sup>	.280	.213	-.229	8
9. Bus. Ad. rec. ed.									1.000	.322	-.287	-.131	-.094	-.087	-.074	9
10. Bus. Ad. tenure										1.000	.028	.106	-.130	-.205	-.237	10
11. Bus. Ad. mobility											1.000	.019	-.392 <sup>c</sup>	-.458 <sup>c</sup>	-.046	11
12. Bus. Ad. prof. j.												1.000	.271	.196	-.273 <sup>d</sup>	12
13. Total enrollment													1.000	.924 <sup>c</sup>	-.348 <sup>d</sup>	13
14. Gr. 9 enrollment														1.000	1.000	14
15. Enrollment type															1.000	15
16. Expenditure																
17. % staff male																
18. Total staff																
19. Religious type																
20. Pupil-staff ratio																
21. Mean train. staff																
22. Mean exp. staff																
23. No. bd. members																
24. % bd. elected																
25. % bd. male																
26. Mean age bd.																
27. Mean occ. ind. bd.																
28. Mean tenure bd.																
29. % Canadian born																
30. Community type																

<sup>a</sup>Correlations are product-moment coefficients unless otherwise specified.

<sup>b</sup>Point biserial correlations.

<sup>c</sup>Significant at .01 level.

<sup>d</sup>Significant at .05 level.

<sup>e</sup>Correlation of two dichotomous variables is inappropriate.



TABLE XLVI (continued)

Variable	16	17	18	19 <sup>b</sup>	20	21	22	23	24	25	26	27	28	29	30 <sup>b</sup>	Variable
1. Supt. age	-0.324	-0.203	0.231	-0.517 <sup>c</sup>	0.100	-0.390	0.004	0.134	-0.239	-0.194	-0.332 <sup>d</sup>	0.375 <sup>c</sup>	0.157	-0.210	0.195	1
2. Supt. amt. ed.	-.279	-.151	.148	-.110	.087	-.260	.151	-.102	.252	-.153	.428 <sup>d</sup>	.296	.130	-.091	.093	2
3. Supt. rec. ed.	-.201	-.171	.237	-.255 <sup>d</sup>	.019	-.237 <sup>d</sup>	.107	.088	.125	-.236 <sup>d</sup>	.032	.253 <sup>d</sup>	.091	-.244	-.262	3
4. Supt. tenure	-.122	-.254	-.085	-.297 <sup>d</sup>	.002	-.474 <sup>d</sup>	.023	-.028	.173	-.315 <sup>d</sup>	-.136	.339 <sup>d</sup>	.017	-.055	.113	4
5. Supt. mobility	-.160	-.133	-.181	.105	.284	.192	.379	-.255	.343 <sup>d</sup>	-.311 <sup>d</sup>	-.036	.100	-.230	-.127	.082	5
6. Supt. prof. j.	-.164	-.038	-.029	-.245	.132	.285	.439 <sup>d</sup>	-.050	.243	-.161	-.128	.264	.123	-.410 <sup>c</sup>	.034	6
7. Bus. Ad. age	.069	.043	-.129	-.166	-.020	.140	.392	.020	.329 <sup>d</sup>	.030	.071	.012	.162	.203	.500 <sup>c</sup>	7
8. Bus. Ad. amt. ed.	.061	-.364 <sup>d</sup>	.312 <sup>d</sup>	.106	.339 <sup>d</sup>	-.040	.080	.007	.093	.093	-.157	.163	.072	-.009	-.298 <sup>d</sup>	8
9. Bus. Ad. rec. ed.	.051	-.008	-.060	-.233	-.120	.064	-.053	-.049	-.361 <sup>d</sup>	-.072	.350	.121	.211	.085	.040 <sup>d</sup>	9
10. Bus. Ad. tenure	-.091	-.174	-.191 <sup>d</sup>	-.179	-.039	-.053	.482 <sup>d</sup>	-.118	-.114	-.097	.005	.305 <sup>d</sup>	.106	.161	.359 <sup>d</sup>	10
11. Bus. Ad. mobility	.149	.287	-.393 <sup>d</sup>	.138	.020	.042	.052	-.248	.130	.045	-.022 <sup>d</sup>	-.113 <sup>d</sup>	-.008	-.005	.182	11
12. Bus. Ad. prof. j.	-.160	-.482 <sup>c</sup>	.271	-.085	.025	-.010	.054	-.083	.266	-.170	-.432 <sup>d</sup>	.313 <sup>d</sup>	.013	-.307	-.277	12
13. Total enrollment	-.102	-.399 <sup>d</sup>	.992 <sup>c</sup>	-.122	.128	-.114	-.060	.396 <sup>c</sup>	.092	-.148	-.091	.315 <sup>d</sup>	.022	-.409 <sup>c</sup>	-.473 <sup>c</sup>	13
14. Gr. 9 enrollment	.043	-.204	.942 <sup>c</sup>	.013	.030	-.126	-.224	.414 <sup>c</sup>	-.016 <sup>d</sup>	-.008	.052	.215	.037	-.344 <sup>d</sup>	-.484 <sup>c</sup>	14
15. Enrollment type	.440 <sup>c</sup>	.629 <sup>c</sup>	-.318 <sup>d</sup>	----- <sup>e</sup>	-.525 <sup>c</sup>	.306	-.295	-.026 <sup>d</sup>	-.300 <sup>d</sup>	.436 <sup>c</sup>	.178	-.435 <sup>c</sup>	-.195	.305	----- <sup>e</sup>	15
16. Expenditure	1.000	.290	-.159 <sup>d</sup>	.323	-.357 <sup>d</sup>	.366	-.149	.329 <sup>d</sup>	-.459 <sup>c</sup>	.433 <sup>c</sup>	.109	-.197 <sup>d</sup>	.001	-.005	.211 <sup>d</sup>	16
17. % staff male		1.000	-.359 <sup>d</sup>	.157	-.098	.153	-.174	.178 <sup>d</sup>	-.392 <sup>d</sup>	.412 <sup>d</sup>	.021	-.380 <sup>d</sup>	-.013	.059	.385 <sup>d</sup>	17
18. Total staff			1.000	-.096	.071	-.137	-.045	.371 <sup>d</sup>	.086	-.077	-.048	.343 <sup>d</sup>	.010	-.364 <sup>d</sup>	-.518 <sup>c</sup>	18
19. Religious type				1.000	.014	.144	-.055	-.230	.083 <sup>c</sup>	.394 <sup>c</sup>	.088	-.380 <sup>c</sup>	-.336 <sup>d</sup>	.466 <sup>c</sup>	----- <sup>e</sup>	19
20. Pupil-staff ratio					1.000	-.124	.147	-.131	.339 <sup>d</sup>	-.294	-.166	.051	-.056	-.138	-.121	20
21. Mean train. staff						1.000	-.004	-.199	-.052	.233	-.129	-.301	.010	-.106	.090	21
22. Mean exp. staff							1.000	-.178	.087 <sup>c</sup>	-.050	.162	.129	.024	-.041	.127	22
23. No. bd. members								1.000	-.361 <sup>c</sup>	.087	-.095	.021	.154	-.384 <sup>d</sup>	.021	23
24. % bd. elected									1.000	-.277	-.192	.030	-.032	-.409 <sup>c</sup>	-.150 <sup>d</sup>	24
25. % bd. male										1.000	-.091	-.201	.054 <sup>d</sup>	.163	.292 <sup>d</sup>	25
26. Mean age bd.											1.000	-.302	.474 <sup>d</sup>	.165	-.192	26
27. Mean occ. ind. bd.												1.000	.161	-.295	-.134	27
28. Mean tenure bd.													1.000	-.263	-.078	28
29. % Canadian born														1.000	.098	29
30. Community type															1.000	30

<sup>a</sup>Correlations are product-moment coefficients unless otherwise specified.

<sup>b</sup>Point biserial correlations.

<sup>c</sup>Significant at .01 level.

<sup>d</sup>Significant at .05 level.

<sup>e</sup>Correlation of two dichotomous variables is inappropriate.





TABLE XLVII

NUMBER OF CASES FOR EACH CELL  
IN INTERCORRELATION MATRIX

TABLE XLVI

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30		
1.	56	56	53	55	55	54	47	46	33	46	44	45	54	52	51	36	36	48	56	46	25	26	50	50	49	25	48	45	46	56	1	
2.		56	53	55	55	54	47	46	33	46	44	45	54	52	51	36	36	48	56	46	25	26	50	50	49	25	48	45	46	56	2	
3.			53	52	52	52	44	43	32	43	41	42	52	50	49	33	33	45	53	44	24	25	47	47	47	25	46	43	43	53	3	
4.				55	54	53	46	45	33	45	43	44	53	51	50	35	35	47	55	46	24	25	49	49	48	25	47	44	45	55	4	
5.					55	54	47	46	33	46	44	45	54	52	51	36	36	48	55	46	25	26	50	50	49	25	48	45	46	55	5	
6.						54	46	45	32	45	43	44	53	51	50	35	35	47	54	45	25	26	49	49	48	25	47	44	45	54	6	
7.							49	48	34	48	46	47	48	46	45	32	33	42	49	40	23	24	46	46	45	25	44	41	40	49	7	
8.								48	34	47	46	47	47	45	44	32	32	41	48	39	22	23	45	45	44	24	43	40	39	48	8	
9.									34	34	32	33	34	33	32	23	21	28	34	28	14	16	32	32	32	21	31	28	28	34	9	
10.										48	45	46	47	46	45	31	32	41	48	39	22	23	45	45	44	24	43	40	40	48	10	
11.											46	45	45	43	42	31	32	40	46	38	21	22	43	43	42	24	42	39	38	46	11	
12.												47	46	44	43	32	32	40	47	38	22	23	44	44	43	24	42	40	38	47	12	
13.													56	54	53	37	36	48	56	47	27	28	51	51	51	26	50	47	46	56	13	
14.														54	53	36	35	47	54	46	26	27	50	50	50	25	49	46	46	54	14	
15.															53	36	35	47	53	46	26	27	50	50	50	25	49	46	45	53	15	
16.																38	27	33	38	31	21	21	38	38	37	20	37	35	31	38	16	
17.																	37	37	37	35	24	24	37	37	36	20	36	35	32	37	17	
18.																		49	49	47	25	25	46	46	45	24	45	43	42	49	18	
19.																			58	47	27	28	52	52	51	26	50	47	47	58	19	
20.																				47	24	24	44	44	44	24	44	42	40	47	20	
21.																					27	28	27	27	27	14	26	26	21	27	21	
22.																						28	28	28	28	15	27	27	21	28	22	
23.																							52	52	51	26	50	47	43	52	23	
24.																								52	52	26	50	47	43	52	24	24
25.																									51	26	50	47	42	51	25	25
26.																										26	25	20	26	26	26	26
27.																											50	47	42	50	27	27
28.																												47	39	47	28	28
29.																													47	47	29	29
30.																														58	30	30



## APPENDIX E

### INTERCORRELATION OF INDEPENDENT AND DEPENDENT VARIABLES WITHIN THE ADOPTER SAMPLE



TABLE XLVIII  
INTERCORRELATION<sup>a</sup> OF INDEPENDENT AND DEPENDENT  
VARIABLES WITHIN THE ADOPTER SAMPLE

Variable	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15 <sup>b</sup>	16	Variable
1. Supt. age	1.000																1
2. Supt. amt. ed.		1.000															2
3. Supt. rec. ed.			1.000														3
4. Supt. tenure				1.000													4
5. Supt. mobility					1.000												5
6. Supt. prof. j.						1.000											6
7. Bus. Ad. age							1.000										7
8. Bus. Ad. amt. ed.								1.000									8
9. Bus. Ad. rec. ed.									1.000								9
10. Bus. Ad. tenure										1.000							10
11. Bus. Ad. mobility											1.000						11
12. Bus. Ad. prof. j.												1.000					12
13. Total enrollment													1.000				13
14. Gr. 9 enrollment														1.000			14
15. Enrollment type															1.000		15
16. Expenditure																1.000	16
17. % staff male																	
18. Total staff																	
19. Religious type																	
20. Pupil-staff ratio																	
21. Mean train. staff																	
22. Mean exp. staff																	
23. No. bd. members																	
24. % bd. elected																	
25. % bd. male																	
26. Mean age bd.																	
27. Mean. occ. ind. bd.																	
28. Mean tenure bd.																	
29. % Canadian born																	
30. Community type																	
31. Ext. of ADP use																	

<sup>a</sup>Correlations are product-moment coefficients unless otherwise specified.

<sup>b</sup>Point biserial correlations.

<sup>c</sup>Significant at .01 level.

<sup>d</sup>Significant at .05 level.

<sup>e</sup>Correlations of two dichotomous variables is inappropriate.





TABLE XLVIII (continued)

Variable	17	18	19 <sup>b</sup>	20	21	22	23	24	25	26	27	28	29	30 <sup>b</sup>	31	Variable
1. Supt. age	0.041	0.288	0.187	0.067	-0.635	-0.456	0.270	-0.105 <sup>d</sup>	-0.012 <sup>c</sup>	-0.733	0.065	-0.117	-0.031	-0.381	0.187	1
2. Supt. amt. ed.	-0.595	.388	-0.408	.539	-0.075	.033	.001	.584	-0.772 <sup>c</sup>	.717	.301	-.113	-.285 <sup>d</sup>	-.410	.302	2
3. Supt. rec. ed.	.240	.296	-.366	.038	-.042	-.565	.436	.266	-.011	-.903	.167	-.219	-.657 <sup>d</sup>	-.292	.189	3
4. Supt. tenure	-.204 <sup>d</sup>	-.217	-.204	.098	-.357	-.429	-.277	.421	-.262	-.443	-.050	.144	.085	-.383	-.180	4
5. Supt. mobility	-.650 <sup>d</sup>	.110	-.309	.312	-.105	-.078	-.150	.312	-.444 <sup>d</sup>	-.076	.332	-.044	-.047	-.220	-.172	5
6. Supt. prof. j.	-.009	.051	-.595 <sup>d</sup>	.445	.047	-.570	.054	.426	-.585 <sup>d</sup>	-.642	-.029	-.156	-.439	.111	.046	6
7. Bus. Ad. age	-.283	-.090	-.139	.256	.284	-.233	-.197	-.087	-.368	-.510	.040	-.072	.112	.608	-.166	7
8. Bus. Ad. amt. ed.	-.181	.299	-.232	.309	.115	.473	-.020	.594 <sup>d</sup>	-.221	.561	.352	.139	-.388	-.100	.477	8
9. Bus. Ad. rec. ed.	.179	.041	.000	.014	.910	.523	.264	-.384	.543	-.392	.246	.050	-.364	.787 <sup>d</sup>	.179	9
10. Bus. Ad. tenure	-.341	-.482	-.078	.101	.298	-.770	-.242	-.151	-.246	.472	-.455	.213	.420	.324	-.496	10
11. Bus. Ad. mobility	.170	-.152	.207	-.027	-.497	-.523	-.241	.066	-.285 <sup>d</sup>	.358	-.535	-.034	.392	-.310	.061	11
12. Bus. Ad. prof. j.	-.133	.354	-.503	.598	-.249	-.187	.253	.544	-.758 <sup>d</sup>	-.697	.534	.197	-.513	-.367	.344	12
13. Total enrollment	-.328	.999 <sup>c</sup>	-.092	.335	-.312	.649	.359	.411	-.388	-.444	.658 <sup>d</sup>	-.416	-.670 <sup>d</sup>	-.555 <sup>d</sup>	.665 <sup>c</sup>	13
14. Gr. 9 enrollment	-.219	.984 <sup>c</sup>	-.097	.269	-.276	.642	.434	.367	-.311	-.471	.607	-.400	-.717 <sup>c</sup>	-.506	.666 <sup>c</sup>	14
15. Enrollment type	.745 <sup>c</sup>	-.373	----- <sup>e</sup>	-.782 <sup>c</sup>	.711 <sup>d</sup>	-.083	.061	-.514 <sup>d</sup>	.328	.000	-.467	-.049	.000	----- <sup>e</sup>	-.240	15
16. Expenditure	.709 <sup>d</sup>	-.219	-.108	-.747 <sup>d</sup>	.823 <sup>d</sup>	.034	.306	-.629 <sup>d</sup>	.429	-.082	-.249	-.026	-.343	.565	-.023	16
17. % staff male	1.000	-.335	-.009	-.610 <sup>d</sup>	.377	-.346	.430	-.624 <sup>d</sup>	.437	-.530	-.681 <sup>d</sup>	.228	-.138 <sup>d</sup>	.548	.083 <sup>d</sup>	17
18. Total staff		1.000	-.076	.308	-.232	.694	.443	.306	-.354	-.429	.742 <sup>c</sup>	-.437	-.640 <sup>d</sup>	-.512	.643 <sup>d</sup>	18
19. Religious type			1.000	-.282	-.347	.551	-.279	-.514 <sup>d</sup>	.328	.000	-.103	-.208	.726 <sup>c</sup>	----- <sup>e</sup>	-.147	19
20. Pupil-staff ratio				1.000	-.701	-.130	.120	.692 <sup>d</sup>	-.695 <sup>d</sup>	.239	.523	.086	-.412	-.419	.389	20
21. Mean train. staff					1.000	.121	.113	-.415	.535	.644	-.170	-.163	-.223	.783 <sup>d</sup>	-.295	21
22. Mean exp. staff						1.000	-.208	-.223	.410	1.000	.654	-.465	-.731 <sup>c</sup>	.188	.105	22
23. No. bd. members							1.000	-.167	-.149	-.405	.043	.190	-.731 <sup>c</sup>	.114	.737 <sup>c</sup>	23
24. % bd. elected								1.000	-.582 <sup>d</sup>	.423	.336	.150	-.567	-.563 <sup>d</sup>	.202	24
25. % bd. male									1.000	.258	-.042	.069	.315	.350	-.365	25
26. Mean age. bd.										1.000	-.124	.556	.510	.000	-.340	26
27. Mean occ. ind. bd.											1.000	-.217	-.365	-.439	.319	27
28. Mean tenure bd.												1.000	.055	.045	.205 <sup>d</sup>	28
29. % Canadian born													1.000	.003	-.605 <sup>d</sup>	29
30. Community type														1.000	-.239	30
31. Ext. of ADP use															1.000	31

<sup>a</sup>Correlations are product-moment coefficients unless otherwise specified.<sup>b</sup>Point biserial correlations.<sup>c</sup>Significant at .01 level.<sup>d</sup>Significant at .05 level.<sup>e</sup>Correlations of two dichotomous variables is inappropriate.



















**B29854**